DOCUMENT RESUME

ED 451 650 EC 308 333

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TITLE Improving Reading Comprehension for Children with Disabilities: A Review of Research. Final Report.
SPONS AGENCY Special Education Programs (ED/OSERS), Washington, DC.
PUB DATE 1998-03-00
NOTE 103p.
CONTRACT HS-92017001
AVAILABLE FROM ED Pubs, P.O. Box 1398, Jessup, MD 20794-1398. Tel: 877-433-7827 (Toll Free); Fax: 301-470-1244.
PUB TYPE Information Analyses (070)
EDRS PRICE MF01/PC05 Plus Postage.
DESCRIPTORS Developmental Disabilities; *Disabilities; Elementary Secondary Education; Hearing Impairments; *Learning Disabilities; *Reading Comprehension; *Reading Instruction; Reading Strategies; Remedial Reading; Research and Development; Theory Practice Relationship

ABSTRACT

This report presents results of a comprehensive review of the research on the improvement of reading comprehension for students with disabilities and is organized into two major sections, the first on learning disabilities and the second on low incidence disabilities. Section 1 is organized into seven chapters which cover: (1) an explanation of the review's methodology; (2) understanding reading comprehension difficulties of students with learning disabilities; (3) interventions focusing on strategy training for improving comprehension of narrative text; (4) improving comprehension of expository text; (5) interventions focused on adapting text; (6) interventions focused on other aspects of reading; and (7) conclusions, an attempt to integrate contemporary research in cognitive psychology and general education. Section 2 examines research on reading comprehension processes and instruction for children with low incidence disabilities. Individual chapters address: correlates of reading comprehension in children with developmental disabilities, reading comprehension instruction for children with developmental disabilities, reading comprehension instruction for children who are deaf or hard of hearing, and conclusions and limitations of reading comprehension for children with low-incidence disabilities. (Contains approximately 260 references.) (DB)

IMPROVING READING COMPREHENSION FOR CHILDREN WITH DISABILITIES: A REVIEW OF RESEARCH

Final Report

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OVERVIEW OF REPORT STRUCTURE

This report is organized into two major sections, the first on learning disabilities and the second on low incidence disabilities. Section I is organized into seven chapters and is primarily a review of empirical research. We conclude this first section with attempts to integrate contemporary research in cognitive psychology and general education.

Historically, reading with comprehension has been considered an unattainable instructional goal for children with developmental disabilities, children who are deaf, and other children with low incidence disabilities. In Section II of this report, we synthesize research on reading comprehension processes and instruction for children with low incidence disabilities. This review of available research suggests that reading with comprehension is a challenging, but realistic, goal even for students with severe and multiple disabilities.

SECTION I

READING COMPREHENSION RESEARCH FOR STUDENTS WITH LEARNING DISABILITIES

CHAPTER 1

INTRODUCTION

A major reason for the poor performance of many children with disabilities is their failure to read strategically and to spontaneously monitor their understanding of what they are reading. This widely held view has led to what has become a major focus of special education instruction and instructional research.

Can these difficulties be overcome by interventions that teach children the reading strategies or other cognitive skills that are needed for successful reading comprehension? Much research has been devoted to instructional approaches that focus on the acquisition, generalization, and monitoring of the cognitive and metacognitive abilities that are needed for successful reading.

In the 1980s, a wave of research was conducted on effective instructional approaches for improving the reading comprehension of students with disabilities. For a variety of reasons, research on this topic has diminished during the past decade. We believe that much was learned during the fertile decade of the 1980s that can immediately improve current special education teaching. We also hope to reinvigorate interest in conducting research on this topic, both because reading comprehension is so important in school success, and because there is so much still to learn. The need to teach comprehension to students with disabilities was highlighted in recent focus groups conducted by the Office of Special Education Programs (OSEP) of the U. S. Department of Education. This sentiment was expressed by family members of students with disabilities, teachers, teacher trainers, and psychologists.

We also know that children with learning disabilities have much more difficulty with reading comprehension than do students without disabilities, even when levels of decoding ability are controlled. This finding questions one current conceptualization of learning disabilities as primarily a problem at the word-reading level and suggests that learning disabilities are more complicated than recognition deficits. The conceptualization of learning disabilities as a broadly based language deficiency highlights the importance of reading comprehension research and practice.

The purpose of this research summary is to critically review the body of research on reading comprehension specific to students with learning disabilities to (1) draw implications for enhancing current practice and (2) suggest directions for future research.

Methodology

The methodology employed in this review is a narrative synthesis of intervention research that has been conducted with students with disabilities. Two broad categories of studies were included. In the first section, we review intervention studies conducted with students with learning disabilities. Our objective was to identify students within the entire spectrum of high-incidence disabilities, but all of the studies that met our inclusion criteria focused specifically on students with learning disabilities. In the second section, we review intervention studies with individuals with more severe cognitive disabilities. A range of disability types are represented in this section.

Expert Input

We began our review of research on reading comprehension among students with disabilities by asking four individuals with expertise in this area to comment on what they perceived were critical issues and findings in the research:

- Janice A. Dole, University of Utah
- Robert Jim nez, University of Illinois
- Michael Pressley, Notre Dame University
- Sharon Vaughn, University of Texas

Dole and Pressley have expertise in reading comprehension, as well as issues related to students at risk for reading failure. In addition to reading comprehension expertise, Jim nez has expertise in instruction for English-language learners, and Vaughn has expertise in instruction for students with learning disabilities and English-language learners.

We asked these individuals to respond to the questions in Exhibit 1-1.

We collated the responses from these four experts and distributed the responses to all members of the synthesis review team. The team included the four primary authors for the section on the reading comprehension of students with learning disabilities, and three primary authors for the section on the reading comprehension of students with more severe cognitive disabilities.

EXHIBIT 1

Questions Asked about Critical Issues and Findings in the Research

As a contributing researcher, your role is to prepare a brief, 500- to 1,000-word e-mail report on our current understanding of the research on reading comprehension as it relates to students with disabilities.

These e-mail reports will serve as working documents to help shape our research synthesis. Remember that the statements should focus on students with disabilities. Feel free, however, to focus on those sub-populations with which you are most familiar (e. g., moderate to severe disabilities, bilingual students, learning disabilities). There is no need for each report to cover the entire field of inquiry.

Your e-mail report should include:

1. What you believe are the major findings and trends in findings over the past two decades.
2. Any principles or specific practices supported by research by your sense of supporting evidence for the assertions (these can include empirical studies, descriptive research, relevant studies from the general education literature, and qualitative research).
3. Areas where you feel the knowledge base is unclear or ambiguous, and what you understand to be reasons for these ambiguities.
4. Any other primary and secondary sources that you think may be relevant to the synthesis.
5. Implementation issues raised by the research.

In addition, you may wish to include your thoughts on:

1. Areas where further research is needed.
2. Areas where existing research could and should be extended to new topics and new populations.
3. Particular measures or measurement strategies that seem to be either useful or consistently problematic.

American Educational Research Conference on Reading Comprehension

Three members of the research team attended the panel discussion at the 1997 AERA conference on reading comprehension. The chair of the panel was Janice A. Dole, and the panel members, plus their areas of discussion, were Michael Graves (Vocabulary), Michael Pressley

(Strategies), Isabel Beck (Questioning), Donna Alvermann (Discussions), Judith Langer (Understanding Narrative Text), and Peter DeWitz (Understanding Expository Texts).

Russell Gersten synthesized the panel discussion by (1) summarizing presentations on the reading comprehension of students with learning disabilities; and (2) delineating major themes, such as deep processing, text structures, and implementation issues, that were also likely to be germane to issues raised in the synthesis of reading comprehension. These notes were distributed to all members of the research team for reflection and feedback.

Selection of Studies for Review

The experts listed above included suggested studies for our review on reading comprehension interventions with students with learning disabilities. They also included for review suggestions of other key articles that addressed reading comprehension.

We used the following procedures to locate primary studies for review. Three recent meta-analyses that addressed reading comprehension and/or interventions with students with learning disabilities were reviewed to identify studies that

- were published in refereed journals prior to 1997;
- were conducted with school-age students;
- used an experimental or quasi-experimental design in which an intervention was implemented to improve the reading comprehension performance of students with disabilities;
- included students with disabilities as either the primary focus, or data analysis procedures to determine the effects of the experimental intervention specifically on students with learning disabilities; and
- included at least one quantitative measure of reading comprehension.

The meta-analyses that we reviewed were: Swanson (in press), Rosenshine and Meister (1994), and Mastropieri, Scruggs, Bakken, and Whedon (1996). The meta-analysis by Mastropieri et al. (1996) addressed reading comprehension studies specifically with students with learning disabilities. Consequently, we conducted a thorough analysis of the studies included in Mastropieri et al. All of the studies that addressed reading comprehension interventions involving narrative or expository text were identified and provided to the primary authors of the relevant sections of the synthesis. These articles, plus the meta-analysis from Swanson (in press) and Rosenshine and Meister (1994), served as the primary studies in our review.

Hand Search

We conducted a hand search for post-1994 articles that address reading comprehension issues for students with learning disabilities. Experimental or quasi-experimental studies were identified. We examined the following journals: *American Educational Research Journal; B.C. Journal of Special Education; Child Development; Cognition and Instruction; Discourse Processes Education and Treatment of Children; Education and Treatment of Children; Exceptional Children; Journal of Curriculum Studies; Journal of Educational Psychology; Journal of Learning Disabilities; Journal of Reading Behavior; Journal of Special Education; Learning Disabilities Research, Learning Disability Quarterly; Psychology in the Schools; Psychology of Learning and Motivation; Reading and Writing Quarterly: Overcoming Learning Difficulties; Reading Psychology: An International Quarterly; Reading Research Quarterly; Reading, Writing, and Learning Disabilities; Remedial and Special Education; Review of Educational Research; Scientific Studies of Reading.*

CHAPTER 2

UNDERSTANDING READING COMPREHENSION DIFFICULTIES OF STUDENTS WITH LEARNING DISABILITIES

Conceptual Framework

We present here a conceptual framework to better understand the reading problems experienced by students with learning disabilities and to understand the conceptual underpinnings of much of the intervention research described in this report. The framework is loosely based on a synthesis of the triarchic model of information processing research developed by Sternberg and his colleagues (Kolligian & Sternberg, 1987). The framework is intended to help the reader focus on critical aspects of instructional interventions and is consonant with much contemporary research. Furthermore, this framework achieves a balance between theory and instructional practices with students with disabilities that is sometimes lacking in other theoretical models of comprehension. As will be seen, various approaches to interventions to increase reading comprehension tend to stress one of the three aspects over the others; however, effective instructional practices depend on adequate attention being paid to all three aspects.

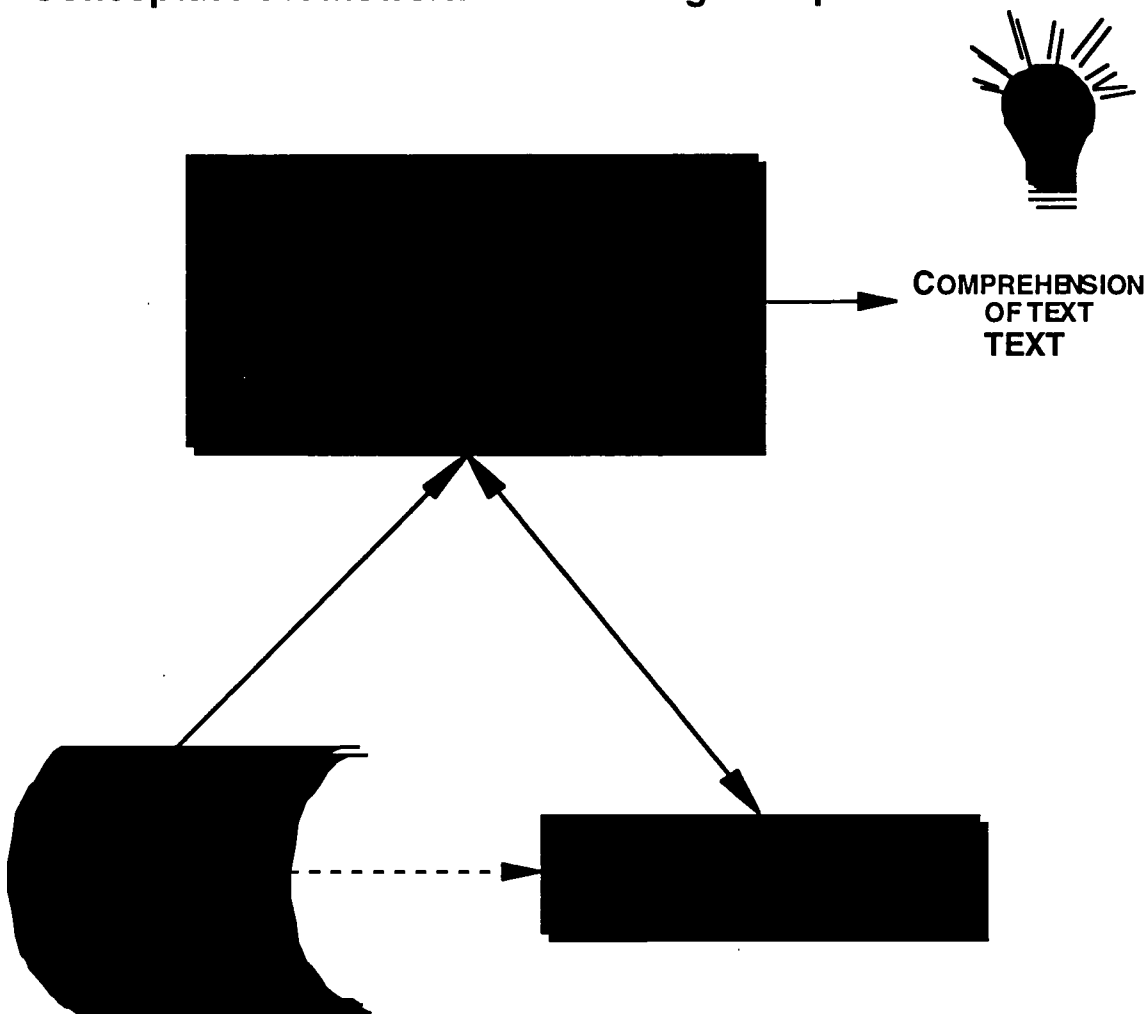
Ultimately, the richness of the Kolligian and Sternberg (1987) conceptual framework is evident in the way the major components link easily to reading comprehension and the real problems experienced by students with learning disabilities.

The framework is extensive but several aspects are particularly germane to reading comprehension. The components help articulate the origin of reading comprehension problems for students with learning disabilities and help us understand the difficulties students experience in using what they know as they encounter new text.

The three critical components of the conceptual framework are illustrated in Figure 2-1.

EXHIBIT 2

Conceptual Framework for Reading Comprehension



A central component of this model is the importance of strategic processing (i.e., use of strategies and skills students learn to derive meaning from text). Research consistently confirms that learning and applying skills and strategies is a critical problem for students with learning disabilities. In a sense, much of the history of research on learning disabilities has been teaching students to master the fundamentals of reading, and the underlying processes they need to read text and to read with understanding.

The richness of the framework is that it also capitalizes on other traditions in special education research and recent breakthroughs in comprehension research (Beck, 1997; DeWitz, 1997). In particular, an important insight has been that teaching strategies and processes are insufficient. Another major problem in the reading comprehension of students with learning disabilities is their lack of task persistence (i.e., they a give up too quickly). This characteristic of

students with learning disabilities was highlighted in large observational research study by McKinney, Osborne, and Schulte (1993). Also, a major emphasis in special education research has been techniques to enhance task persistence through (1) reinforcement (extrinsic motivators), (2) intrinsic motivation, and (3) increased rates of interaction with peers regarding instructional matters (i.e., peer-mediated and socially mediated instruction).

The conceptual framework of Kolligian and Sternberg begins to integrate the often disparate traditions of teaching skills and processes, and teaching students to be persistent and diligent when trying to accomplish learning activities.

Furthermore, cognitive research increasingly stresses that above and beyond knowledge of strategies, task persistence is a major element in comprehension for all people, especially for expository text (DeWitz, 1997). In other words, a major movement in the field of comprehension has been to develop teaching approaches that actively encourage students to persist in figuring out what the text is saying (e.g., Beck, McKeown, Worthy, Sandora, & Kucan, 1996). Many of these approaches devise means to encourage students with learning disabilities to persist in the challenging task of figuring out what the book is saying.

Motivation and persistence affect performance in all academic areas. Many theories of learning disability discuss the influence of motivation, but usually in isolation from other factors such as difficulty processing information and insufficient background knowledge. The beauty of the Kolligian-Sternberg framework is that it s a constant reminder that all three facets are interrelated. For example, constructs such as strategy use and motivation work in concert and interact with each other.

Motivation is clearly a central concern. As students experience failure, because they either have knowledge problems or have difficulty applying learning strategies, the accumulation of repeated unsuccessful efforts to solve academic problems decreases their motivation for working hard at learning tasks. In many ways, this pattern is similar to Stanovich s (1986) suggestion that one result of the Matthew effects is that students begin to select environments that minimize the amount of academic engagement they have with things they are not good at in the case of comprehension, this includes reading at school (e.g., taking classes that require large amounts of reading), as well as after-school recreation (such as reading a book for pleasure). Kolligian and Sternberg include a component in their framework in which they discuss the role learners play in *adapting* to environments in which reading is demanded, *shaping* those environments to better meet their skills, and ultimately *selecting* new environments that are more aligned with their perceived abilities and skills.

In conclusion, the framework recognizes both the dire consequences that gaps in relevant background knowledge have in successful and meaningful comprehension, and the problems many students with learning disabilities have in linking what they know to new information they encounter in a text.

As will be seen, many students with learning disabilities have gaps in their knowledge of history, geography, and the whole host of academic subjects, which interferes with their understanding of the material they read. This has proven to be a fertile area for instructional research, as has the topic of sensitivity to text structure, which will be a major focus of this report.

Characteristics of Students with Learning Disabilities

The Kolligian and Sternberg (1987) framework is consonant with emerging findings from reading researchers in the field of special education. Researchers have determined that a major problem in comprehension for students with learning disabilities stems from their lack of knowledge both general world knowledge and, of particular importance, knowledge of how different types of texts, such are narratives, are structured. Thus, they bring less knowledge to the reading task than do students without disabilities, and their comprehension suffers accordingly.

Researchers have identified specific characteristics that students with learning disabilities exhibit during reading, which lead to difficulties. Students with learning disabilities tend to process information *inactively*, and they have difficulty inhibiting irrelevant associations. Both inactive learning and irrelevant associations are indications of problems in the area of metacognition. Finally, students with learning disabilities frequently display insufficient motivation to persist in reading comprehension activities.

Weaknesses in Knowledge Base

Weak knowledge of basics or lack of automaticity with basics leads to more and more severe problems over time. This is true in reading comprehension and other subject areas, such as mathematics. For example, the cumbersome process of calculating facts (particularly for fourth-, fifth-, and sixth-grade students with learning disabilities) interferes significantly with their strategic processing of algorithms. Similarly, inefficient decoding interferes with comprehension.

Lack of Relevant Background Knowledge

Comprehension also depends on the extent of the reader's general background knowledge about the topic. If the text content is familiar, comprehension will be easier. Having insufficient prior knowledge or failing to activate one's prior knowledge can interfere with comprehension (Langer, 1984). For example, in one investigation of the effects of prior knowledge on reading comprehension, Snider (1989) gave 13 junior high school students daily instruction for three weeks on factual information and vocabulary relevant to a series of short fictional passages. Another 13 did not receive this instruction. The instructed group answered significantly more comprehension questions correctly, demonstrating the importance of relevant background knowledge for higher-level thinking and comprehension.

Such demonstrations of the importance of background knowledge are highly convincing, and researchers have often recommended interventions that will directly provide relevant knowledge when needed. There have also been several recommendations for classroom practice (Snider, 1989). First, for students with learning disabilities who are still trying to master decoding, information and vocabulary concepts (both important aspects of prior knowledge) must be supplied through non-reading channels. Second, what the school typically demands in terms of prior knowledge must be evaluated, and the curriculum modified if necessary, to accommodate individual learners.

A deficiency in prior knowledge is sometimes a result of the fact that students with disabilities often have had difficulty in beginning reading instruction and have, therefore, spent a greater proportion of school time on decoding instruction and less time on reading for information. Sometimes very little time is spent actually reading texts. Since much information and vocabulary knowledge are acquired through reading, these students begin to lag behind. As the years progress, the gap between non-disabled students and those with disabilities widens. Snider and Tarver (1987) have described the deleterious cumulative effects of the initial decoding problem on comprehension. Stanovich (1986) has called this the "Matthew effect," in which the rich get richer and the poor get poorer (a biblical allusion).

Lack of Knowledge of Story Structure

Children with learning disabilities also develop structural knowledge about stories. For example, they recall more of the information representing major story-grammar categories from a story than other information in the story (Hansen, 1978; Weaver & Dickinson, 1982; Williams, 1993). They also recognize which story events are closely related to the basic causal chain of a story (Wolman, 1991); research on causal chain analysis is a recent alternative to story-grammar analysis.

For example, Wolman, van den Broek, and Lorch (1997) asked fourth- , fifth- , and sixth-grade children with learning disabilities to read stories on a third-grade readability level. The stories had been modified so that one of the episodes was removed from the causal chain of the story, making it unrelated to the final outcome of the story. These doctored stories were compared with the same stories in their original versions. The students recalled more statements from the original stories, in which the target episode was on the causal chain, than from the modified stories, in which the target episode was off the chain. Also, more statements were recalled as the number of causal connections increased. When the test of recall was delayed for four or five days, the pattern remained. In other words, the effects of causal structure were similar on both immediate and delayed recall, suggesting that causal structure is the foundation of a coherent representation of a story in memory. There were no differences between students with disabilities and students at the same grade levels who did not have learning disabilities.

However, children with learning disabilities clearly differ from normally developing children in several ways. Cain (1996), using a story-production task, found that students with learning disabilities showed less knowledge of story structure than did younger children matched on comprehension skill. They also recall considerably less information from a story (Hansen, 1978). Perhaps most important, they cannot as easily pick out the important information in a story (Wong, 1979).

There are few studies on how children with disabilities perform on higher-order tasks. We do know, however, that they do not recall as much information about story characters as other children (Curran, Kintsch, & Hedberg, 1996; Weaver & Dickinson, 1982). Oakhill and Yuill (1996) compared two groups of children matched on reading accuracy and vocabulary, and found that those who had specific comprehension difficulties were poor at making inferences; and Yuill and Oakhill (1991) found that they were also poorer at picking out the main point of stories on a multiple-

choice test. Williams (1993) and Abrahamsen and Sprouse (1995) found that children with disabilities were less able to identify the morals of fables.

Studies such as those cited above have led researchers to design interventions that will enhance students knowledge of story structure (e.g., by teaching them a story grammar, and thereby improving their comprehension). We will discuss these studies in this report.

Lack of Knowledge of Expository Text Structures

Some have argued persuasively that children's comprehension difficulties in expository text may be explained by the text-processing strategies that students with and without structure awareness use. Meyer, Brandt, and Bluth (1980), for example, asserted that readers who are unaware of text structure and their signaling devices employ a strategy of serial and discrete encoding of text, with random retrieval of ideas. Structure-aware readers, on the other hand, rely on more effective strategies whereby they search text for ways to relate chunks of information, which in turn reveal text structures.

Support for this proposition is found in work that examines students' sensitivity to expository text structure. Englert and Hiebert (1984) measured awareness of description, comparison/contrast, and collection structures among third- and sixth-grade students. Third-graders were less competent at identifying distracter sentences in description than in collection structures; sixth-graders performed similarly across text structures and better than third-graders. Using a measure that probed awareness of text structure more deeply, Richgels, McGee, Lomax, and Sheard (1987) documented that middle-school students were more aware of comparison/contrast structures than of causation structures and that, even among sixth-graders, students aware of structure were more likely to use a structural strategy than their peers who were unaware of structure.

In fact, the empirical literature provides the basis for three major conclusions concerning text structure and comprehension of expository text. First, awareness of text structure is acquired developmentally (Brown & Smiley, 1977; Danner, 1976; Englert & Hiebert, 1984). Second, some text structures are more obvious and easier for readers to comprehend (Englert & Hiebert, 1984). Third, skill at searching for and using text structure is an important strategy underlying effective comprehension of expository text (Hiebert, Englert, & Brennan, 1983; Taylor, 1980; Taylor & Beach, 1984; Taylor & Samuels, 1983).

Problems in Strategic Processing

Many problems can arise in the strategic processing of text. First, students may not have an appropriate strategy for a particular situation. For example, they might not realize that they should monitor their comprehension so that they can go back and re-read if necessary. Second, students may not know when to use a strategy they possess. Third, strategy use interacts with motivation. Since some strategies are capacity-demanding and onerous, especially for young children, students may not be willing to use them (DeWitz, 1997; Pressley & McCormick, 1995).

Other Conceptual Frameworks

Over the years, several different conceptions of the nature of learning disabilities have influenced research and practice in special education (Wixson & Lipson, 1991). Most recently, the older idea that some deficiency in one or more of the basic components of cognitive processing causes disabilities has given way to the current view that *inefficiency* rather than *deficiency* most accurately characterizes the processing differences between students with and without learning disabilities. In other words, students with disabilities have the necessary components to effectively process information, but for some reason they do it very inefficiently. Most researchers suspect that the breakdowns occur in the domain of metacognitive processing (i.e., the ability of students to reflect on their thinking and to manage and control their cognitive activities).

The Inactive Reader

Reading is a complex activity. It requires the successful selection, application, and monitoring of multiple strategies (Wixson & Lipson, 1991), and children with learning disabilities have great difficulties acting on these requirements. The conceptualization of the child with learning disabilities as an "inactive" learner (Torgesen, 1977) accounts for data indicating that even when given specific techniques (e.g., they are told to underline and told how to do it), students with learning disabilities only sometimes display improved reading (Torgesen, 1982).

Successful interventions have been developed and implemented, however, and provide insights into ways to improve the reading comprehension of students with disabilities. A 1986 study by Jenkins, Heliotis, Haynes, and Beck included students with and without disabilities in the third through sixth grades. Students read a series of folk tales and were told to write a brief statement summarizing each paragraph as they finished reading it. Their answers to a series of comprehension questions showed a better grasp of the important information in the texts than the answers of students who were not directed to write such summaries. The authors interpreted their findings as indicating that conditions that effectively force a student to focus attention on what was read will allow the student s basic cognitive abilities to "work." Interestingly, students without disabilities also showed improvement in comprehension when they summarized each paragraph, leading to the conclusion that they, too, are prone to be somewhat inactive readers. Jenkins et al. did not offer the activity of writing restatements while reading as an appropriate intervention strategy, because it is so slow and requires considerable effort. However, the study does demonstrate the "inactive reader" pattern under school-like conditions and underscores the promise of this conceptualization of the difficulty for remediation.

The Freely Associating Reader

Williams (1993) has proposed another source of difficulty for students with disabilities. In an interview to understand students comprehension of stories that had been adapted from a natural text and their ability to identify story themes, adolescents with learning disabilities performed below the level of same-age students without learning disabilities and at the same level as younger students

without learning disabilities matched on scores of standardized reading comprehension. However, on one sensitive measure of theme identification (incipient awareness of theme), the students with learning disabilities scored below the younger students without learning disabilities. Also, the students with learning disabilities had greater difficulty identifying the important information during their summarizing and discussion of the story than students without learning disabilities, and such difficulty was associated with poorer theme identification. The findings suggest that students with learning disabilities have specific difficulty "getting the point," perhaps because they build up less effective text representations through the inappropriate use of background knowledge or the intrusion of personal points of view.

Another study involving adolescents with learning disabilities (Williams, 1991) drew the same conclusion. This study also involved narrative text. The frequency of idiosyncratically identifying important points of the story correlated negatively with the number of appropriate predictions (based on text information) of what the main character would do to solve a particular problem. In other words, students who tended idiosyncratically to introduce into stories inaccurate or irrelevant information also had more difficulty making accurate predictions based on story content. This difficulty is similar to the problem described as lack of cognitive inhibition, which has been noted as a characteristic of the elderly, and directly relates to difficulties in monitoring cognitive processes.

Overview of Subsequent Chapters

We cover several types of interventions. One important type consists of interventions that attempt to teach students to use comprehension strategies that they do not typically use. When a strategy proves effective in initial, small intervention studies, the strategy can be elaborated and refined into genuine instruction (e.g., developed into lessons that are usable in real classroom situations). Sometimes this takes the form of complete instructional packages for teachers; at other times, more general recommendations for instruction, but no actual materials, are offered.

During the 1980s, strategy instruction became extremely popular as researchers attempted to apply new theories of reading drawn from cognitive psychology to reading instruction. Most of the research on strategy instruction can be divided into two categories: (1) studies that teach students to monitor their comprehension, thereby improving their metacognitive skill and making them more active readers; and (2) studies that teach students to discern and appreciate the underlying structures of texts they read (typically the story grammar structure in narrative), because research has shown, as described above, the value of an organizational framework in aiding memory and comprehension of text. They are usually categorized as strategy instruction because what students are taught, for example, is to use such an outline or schema to generate questions about the text that they are about to read or have just read. These questions focus the students' attention on the important information in the text. The emphasis thus turns on a specific activity, or strategy, that the student engages in.

In another type of intervention, the goal is not to modify the abilities of the student, but rather, to modify or adapt the text so that it is more easily understood or to teach content in a fashion that circumvents the necessity of reading the text. Research of this type is typically focused

on expository text and on older children, because curricular requirements at the middle-school level and beyond involve comprehending and remembering information presented in content-area subjects. (Many children, with and without disabilities, have great difficulty with this.)

A third type of intervention is justified on entirely different grounds. Here, it is argued that students with learning disabilities may not have any difficulty with comprehension per se, but rather that their problems derive from difficulty in other aspects of reading. That is, they have not mastered basic reading skills to a sufficient degree and/or their reading fluency is not good enough to allow them to understand the material they are reading

The rest of the section on learning disabilities research comprises five chapters. Chapters 3 and 4 review research conducted on the comprehension of narrative and expository text by students with learning disabilities, with emphasis on strategies for enhancing comprehension. Chapter 5 discusses research on interventions that focus on changing or supplementing text so that students with disabilities may better understand it. Chapter 6 summarizes research on providing training in basic skills needed for fluent reading as a way to improve comprehension among students with disabilities. Chapter 7 provides conclusions based on research reviewed in this report.

CHAPTER 3

INTERVENTIONS FOCUSING ON STRATEGY TRAINING FOR IMPROVING COMPREHENSION OF NARRATIVE TEXT

The content of narratives is usually more familiar than the content of expositions. Generally speaking, narrative is easier to comprehend and to remember than are expository genres, such as descriptions or analysis of cause and effect, and for these reasons, stories are ubiquitous in beginning reading instruction. When children start to learn to read, the first texts they encounter are usually narratives.

A narrative depicts sequences of events involving characters and their actions, goals, and feelings. Such event sequences correspond in many ways to the sequences of events that children experience directly and that constitute the core content of their world knowledge (Nelson, 1986). More abstract forms of knowledge (taxonomic and causal reasoning, for example) are built up from event knowledge.

Language plays a large role in building up knowledge: children hear other people talking about events; they watch television and movies; and they describe and justify their own experiences. In these ways they vicariously gain added knowledge about the world.

The stories given to children in the early grades offer a natural transition from oral to written language (Westby, 1985) and provide opportunities to gain knowledge that is far more wide-ranging than could be gained from personal experiences alone. Stories not only help develop important basic academic skills but also other cognitive and social skills. Indeed, people acquire much of the general knowledge of the world that they possess as adults through what they read.

A story is structured in a particular way: it describes a temporal sequence of events concerning one or more characters and it reflects the goal of the characters. A very general outline of the structure of a story would include the setting, the characters, a goal (sometimes called the problem), a series of actions presented in episodes, internal reactions of the characters, and a resolution or outcome. Researchers call such outlines story grammars and have shown that having some knowledge of the basic structure of a story aids comprehension and recall. Note that this is an aspect of world knowledge, too: it is knowledge of the way in which stories are organized.

It is not surprising that there has been a great deal of research on narrative text. Much of this work has focused on story structure as an organizing framework. Even pre-school children use story structure. For example, they remember less of a story when it is presented in scrambled form

so that the components of the underlying story grammar are not presented in their typical order (Mandler & Johnson, 1977).

This early ability to use knowledge of story structure to aid comprehension continues to improve as children get older (Trabasso & Stein, 1997). Older children are better than younger children at identifying important story information (e.g., the characters and goal in recalling subtle story events such as the feelings of the characters (Beach & Wendler, 1987; van den Broek, 1997)); and they are also better able to make inferences (Oakhill, 1984; Oakhill & Garnham, 1988) and to identify story themes (Lehr, 1988; Williams, 1993).

Given the low performance in reading comprehension among students with learning disabilities and the reasons that have been advanced to explain why performance is low, what steps are being taken to try to improve performance? There has been a good deal of intervention research over the last twelve years. Exhibit 3 lists the relevant studies.

EXHIBIT 3
Studies on Improving Comprehension of Narrative Text

Carnine, D., & Kinder, B. D. (1985). Teaching low-performing students to apply generative and schema strategies to narrative and expository material. *Remedial and Special Education, 6*, 20-30.

Chan, L. K. S., & Cole, P. G. (1986). The effects of comprehension monitoring training on the reading competence of learning disabled and regular class students. *Remedial and Special Education, 7*, 33-40.

Chan, L. K. S., Cole, P. G., & Barfett, S. (1987). Comprehension monitoring: Detection and identification of text inconsistencies by learning disabled and normal students. *Learning Disability Quarterly, 10*, 114-124.

Fuchs, L. S., & Fuchs, D. (1994). Academic assessment and instrumentation. In S. Vaughn & C. Bos (Eds.), *Research issues in learning disabilities: Theory, methodology, assessment, and ethics* (pp. 233-245). New York: Springer-Verlag.

Fuch, D., Fuch, L. S., Mathes, P. G., & Simmons, D. C. (1997). Peer-assisted learning strategies: Making classrooms more responsive to diversity. *American Educational Research Journal, 34*, 174-206.

Gurney, D., Gersten, R., Dimino, J. & Carnine, D. (1990). Story grammar: Effective literature instruction for high school students with learning disabilities. *Journal of Learning Disabilities, 23*, 335-348.

Idol, L. (1987). Group story mapping: A comprehension strategy for both skilled and unskilled readers. *Journal of Learning Disabilities, 20*, 196-205.

Idol, L. & Croll, V. J. (1987). Story-mapping training as a means of improving reading comprehension. *Learning Disability Quarterly, 10*, 214-229.

Newby, R. F., Caldwell, J., & Recht, D. R. (1989). Improving the reading comprehension of children with dysphonetic and dyseidetic dyslexia using story grammar. *Journal of Learning Disabilities, 22*, 373-380.

Williams, J. P., Brown, L. G., Silverstein, A. K., & deCani, J. S. (1994). An instructional program in comprehension of narrative themes for adolescents with learning disabilities. *Learning Disability Quarterly, 17*, 205-221.

Training of Strategies for Reading Narrative Text

It is widely accepted that a major reason for the poor performance of many children with learning disabilities is the failure to read strategically and to spontaneously monitor their understanding of what they are reading. This view has led to what has become a major focus of remediation. Can such a deficiency be overcome by intervention, specifically, by the explicit training of strategies?

Much research has been devoted to instructional approaches that focus on the acquisition of the cognitive and metacognitive abilities that are needed for successful reading. These approaches address the two components of metacognition: (1) awareness of the skills, strategies, and resources that are necessary for success; and (2) control of those skills, strategies, and resources (i.e., the ability to self-regulate so that effective performance will be achieved).

An essential component, reading with understanding, then, is the ability to reflect on a task and to examine and evaluate how well it is being carried out. To teach this means teaching knowledge, making the students aware of the state of their comprehension and providing them with "repair strategies" if in fact they determine that they are not actually understanding the text adequately. This is typically called comprehension-monitoring, and the first series of studies that will be described is focused on this topic.

Comprehension Monitoring

Chan and Cole (1986) worked with 11-year-old students with learning disabilities in the fifth and sixth grades and 8-year-old regular-class students in the third grade. The two groups were matched on reading level. They were given training in how to help themselves remember what they read; a toy robot was used as a motivational device and to demonstrate the strategy being taught. Short passages consisting of descriptive information in story form were used.

Students were assigned to one of four experimental conditions. In the first condition, students were taught to generate questions about the content of each paragraph they read. In the second, they were taught to underline two interesting words in the passage and then explain why they were interesting. In the third condition, both the self-questioning and the underlining techniques were taught. The fourth condition was designed to control for the additional instructional time spent on each paragraph; students in this group reread the story. After each passage, students were given multiple-choice questions and were provided with feedback to their answers.

The results demonstrated the usefulness of metacognitive training for students with learning disabilities. The students in all three groups who were taught strategies performed at a higher level on the reading comprehension test than did those in the control group. Thus these students displayed a production deficiency: on their own, they did not use the strategies that would have helped them. However, there were no such differences for the non-disabled students, suggesting that these children used some sort of cognitive strategy even when they were not explicitly asked to do so. (Wong, 1979, and Wong and Jones, 1982, also observed that teaching questioning strategies that proved valuable for students with disabilities was superfluous for normally achieving students.)

There were no significant differences among the three experimental conditions. Chan and Cole (1986) suggest that the improvement had come about not because of the specific strategies that had been taught but because the students in these conditions had been involved in active interaction with the texts; that had triggered the use of strategies that, as inactive learners, these students possessed but did not normally use.

There is a further question. While it is important to know that students with learning disabilities can be explicitly taught to use metacognitive strategies, it is also important to know whether they will use the strategies that they have been taught after they have left the training situation (or, in real life, the classroom). Chan and Cole later asked the students to read another two passages, without mentioning the robot or the strategies they had learned. Only the students in the underlining-only group used the strategy that they had been taught and their performance on the multiple-choice questions was superior to that of the other three groups. The authors speculate that it probably was easier to underline than to generate questions, and also that the students enjoyed the underlining, which was done with fluorescent markers. Overall, however, these results are not optimistic as to the potential for teaching these students metacognitive strategies and having them continue to use the strategies after the completion of training. Indeed, this conclusion seems to be true even for populations other than students with learning disabilities (Kenney, Cannizzo, & Flavell, 1967; Ringel & Springer, 1980).

In another study, Chan, Cole, and Barfett (1987) taught a cross-referencing technique to 11-year-old students with learning disabilities and 8-year-old regular-class students matched on word-recognition level. The students were asked to detect internal inconsistencies in adventure stories that had had two anomalous sentences inserted. In the general instruction condition, the task of monitoring text for inconsistency was demonstrated without an explanation of why particular sentences were inconsistent; in the explicit instruction condition, there was such an explanation and, unlike the first condition, the students were actively involved in deciding which stories contained anomalies. As in the previous study, explicit strategy instruction did not help the non-disabled students. However, it did help the students with learning disabilities, both in detecting anomalies and in improving their comprehension of the stories.

The explicit training provided instruction in the use of the strategy, and it also provided a clear explanation of the criterion task. The fact that only a small amount of training (on two passages) was given suggests strongly that the students had the cognitive ability prior to the study but that they could not use that ability without support.

Idol-Maestas (1985) developed an advance organizer called "tells fact or fiction" to orient students with learning disabilities to stories before the stories were read. Her advance organizer (a comprehension-probing exercise) was designed to provide activities that (1) encourage students to pay attention and to activate prior knowledge and (2) incorporate teacher guidance. She formulated the organizer into an acronym on the basis of the reports from the Kansas research institute on learning disabilities that acronyms are effective in reminding adolescents with learning disabilities of required steps in a strategy (e.g., Schumacher, Deshler, Nolan, Clark, Alley, & Warner, 1981). Idol-Maestas's steps were: (t) study story titles, (e) examine and skim pages for clues as to what stories are about, (l) look for important words, (l) look for hard words, (s) think about the story settings, and (fact or fiction) decide whether stories are factual or fictional.

Idol-Maestas's study involved four elementary-school students with learning disabilities whose ages ranged from 8 to 12. She used a single-subject design with multiple baselines. On each day of the baselines, students read aloud a story of at least 100 words taken from a basal reading series. Ten comprehension questions, including questions that required inferences, were asked after each story, and reading accuracy and rate were also noted. In the intervention condition, stories were read and questions asked in the same manner, and in addition, students completed the tell fact or fiction advance organizer. The student first read each probe (What is the title? Does it give a clue as to what the story is about? etc.) and then responded. Teacher guidance was offered if necessary. When a stable comprehension pattern of at least 80 percent correct was established, participants were returned to the initial baseline conditions and were told that they could use the tell fact or fiction strategy if they wished to.

The intervention improved all four participants' baseline performance on the comprehension questions, and when the intervention was removed, there was a decline in performance. The students also improved their grade-equivalent scores on the gray oral reading test (these scores reflect accuracy and rate), as measured before and after the study, and three of the four students also improved on a test of listening comprehension.

Thus, as other studies also show, poor comprehenders could be guided to improve their comprehension, including inferencing, via a pre-reading strategy that activated attention and prior knowledge. But this does not necessarily mean that when the teacher's guidance is removed the improvement will be maintained.

Visual Imagery

Paivio's (1971) dual-coding theory, which asserts that learning may be either verbal or visual, has been invoked as a foundation for the development of visual imagery training. If children with learning disabilities have inefficient metacognitive strategies, and if, as early studies (e.g., Torgesen & Goldman, 1977) showed, reading- disabled students could be taught verbal strategies, why would it not also be feasible to use visual strategies to improve reading comprehension? In a study by Rose, Cundick, and Higbee (1983), elementary students with learning disabilities read stories, presented one paragraph at a time, and answered comprehension questions after one of three "mnemonic teaching conditions": verbal rehearsal, in which they were instructed to talk to themselves aloud about what they were reading, after every few sentences; visual imagery, in which they were instructed to close their eyes and make a mental picture or movie about what they were reading, after every few sentences; or unaided recall, in which they were told to concentrate. Both strategy groups outperformed the unaided recall group, but the visual imagery group was no better than the verbal rehearsal group. Over the years, the interest in visual imagery as a metacognitive strategy has waned, largely due to the lack of promising findings and to the fact that children report that imaging requires considerable cognitive effort during reading (Rose et al., 1983).

Questioning Guided by Narrative Text Structure

Many studies focus on a strategy that derives from the recent work on text structure (Singer & Donlan, 1982). Students are taught to identify the principal components of a story, which we know aids comprehension (see above), and then to use this knowledge of text structure as an organizational guide when reading. That is, they learn to look for those components when they encounter a new story. The studies that deal with students with learning disabilities closely follow a large literature on non-disabled students.

Idol and Croll (1987) trained five intermediate-level elementary students with mild learning handicaps and poor reading comprehension as judged by their teachers. The IQs of these children were in the high eighties. A training procedure was designed that not only taught story structure as an organizational framework but also used teaching techniques that typically have been found valuable with poor learners (i.e., very precise teacher presentation and feedback techniques coupled with multiple opportunities for practice). The story structure instruction used a pictorial story map in lieu of a series of questions, because the authors felt that low-achieving special-needs students would require something concrete. The outline of the story map components included setting (characters, time, and place), problem, goal, action, and outcome. The students read a story or a story segment orally for 20 minutes each day at a reading level at which comprehension was poor but rate and accuracy relatively high. They then retold the story from memory and then answered orally ten comprehension questions that were geared to the story structure outline.

Four of the five students demonstrated strong comprehension gains across the dependent measures, which included performance on the comprehension questions, length and quality of story retell, and performance on standardized reading tests. This indicated the power of story mapping; indeed, although the generic questions were used during the baseline, those alone did not lead to improvement. All four of these students also maintained their mastery level of 80 percent correct comprehension when they were no longer directed to use the story-mapping strategy. There was some indication that these students also improved on standardized reading tests and on listening comprehension.

In addition, three of these students showed some generalization to classroom reading materials, which is a very difficult type of effect to achieve following an experimental training procedure. The fifth student improved marginally on some of the measures, but his slow progress meant that no maintenance phase could occur.

In the other study, Idol (1987) used the same story-structure-mapping strategy and multiple-baseline design, but the strategy was adapted for teaching groups of children with varied abilities (at the third- and fourth-grade level). A typical teacher-model, teacher-assist, and independent-practice paradigm was used.

Group averages for daily comprehension were maintained above 80 percent correct when the students were no longer required to use the strategy, and the improvements generalized to measures of listening comprehension, criterion-referenced tests, and spontaneous story writing, though not to the Nelson reading skills test. These results strengthened the findings of Idol and Croll (1987) concerning the effects of Idol's specific story-mapping instruction and also demonstrated that such performance improvements can be achieved without the use of ability grouping.

Carnine and Kinder (1985) taught elementary students with learning disabilities to generate four generic story grammar questions: "Who is the story about?", "What are they trying to do?", "What happens when they try to do it?", and "What happens at the end?" The use of this strategy, along with the incorporation of principles of direct instruction (e.g., explicitness, repetition, and feedback (Brophy & Good, 1986; Gersten & Carnine, 1986)), led to substantial improvement in performance on short-answer comprehension questions and on free-recall measures, and gains were maintained two to four weeks after the intervention.

Newby, Caldwell, and Recht (1989) took a similar approach; they also taught story grammar as a strategy, but their procedure was modified for 8- to 10-year-old children with either dysphonetic and dyseidetic dyslexia. For the dysphonetic children, pictographs were used, to capitalize on these children's simultaneous mental processing strengths. The dyseidetic children were given a sequentially based instruction in which the story components were presented in a prescribed order (as they appear in a well-formed story). A multiple-baseline, single-subject experimental design was used. Results showed no clear increase in amount of story content recalled, but there was a significant improvement in the importance level of the ideas recalled.

Thus this study demonstrated, again, the effectiveness of this metacognitive method of organizing narrative text for comprehension. The treatments of the two types of dyslexics appeared to be equally appropriate, but the study was not designed to determine whether the differential strategies had specific benefit for the matching types of dyslexia or whether general metacognitive training without specific tailoring to subtype is equally effective. Stability of gains after the termination of treatment and transfer effects were not assessed in this study.

In 1990 Gurney, Gersten, Dimino, and Carnine examined the effectiveness of a similar instructional strategy for teaching comprehension of literature to high school students with learning disabilities. Seven students with IQs ranging from 83 to 106, and reading ranging from fourth- to eleventh-grade levels, were given either story grammar instruction or traditional basal literature instruction for a period of nine weeks. In the story grammar instruction, in addition to the story components typically taught to elementary students, *theme* was also identified as a component. A modeling/guided- practice/independent-practice paradigm was used.

In the other, traditional instructional treatment, procedures outlined in the teachers' guides for basal readers were followed. These procedures included the teaching of related vocabulary, discussion of background information, and oral reading of the (same) stories, answering comprehension questions orally on story details, inferences, and literary techniques, and completing worksheets. The story grammar instruction proved to be the more effective teaching technique for teaching students to comprehend important elements in short stories; interestingly, it did not improve students' ability to answer the basal literature questions that typically are found in high school literature anthologies. According to the authors, such questions generally focus on minor, literal details, and they certainly do not represent the desired outcome of high school literature instruction.

At the end of the study, all students were interviewed individually. All of them reported that they liked the instruction and the stories, especially the suspense, adventure, and mystery stories.

Most of the students in the story-grammar treatment said that the instruction had made them feel more confident about their comprehension.

Gurney et al. (1990) further reported that theme was the most difficult story component to teach, requiring extensive teacher modeling and direct explanation. Theme is usually considered very difficult to teach and, in fact, has not been addressed in most instruction, whether of special education students or others (Purves, 1981). A theme is abstract and, except in the fable genre where the moral of the story typically appears at the end, is rarely stated explicitly. The reader must go beyond plot-level comprehension to identify a generalizable plot pattern (theme concept) and then even further, as described below.

Williams, Brown, Silverstein, and deCani (1994) described an instructional program designed to help students with learning disabilities learn about the concept of theme, identify themes in stories, and apply themes to real life. The instruction followed the proved effective paradigm of teacher explanation and modeling, guided practice, and independent practice. It was focused on teaching story grammar components via organizing (story schema) questions, as in previous studies, and then on teaching theme identification via additional questions. Then, a final set of questions helped students generalize the theme to other relevant life situations.

The stories were taken from basal readers and trade books. Several stories exemplified a single theme, such as perseverance. Each of the other stories exemplified a different theme, such as greed and cooperation. Two studies evaluated the program. In the first study, fifth- and sixth-grade non-disabled students and students with mild learning disabilities participated; in the second, seventh- and eighth-graders with more severe learning disabilities participated. In both studies, the program improved comprehension of the concept of theme and identification of the theme that had been emphasized in instruction (perseverance). Students who had been given the instructional program were more successful on both measures than students who received no instruction or traditional instruction (which involved teaching techniques currently found in basal readers, including pre-reading discussion, vocabulary development, oral reading of the story, and then questions and discussion related to both factual details of the story and inferences derived from it).

Applying a theme to real-life situations and identifying and applying themes not included in instruction were more difficult tasks, especially for the more severely disabled students. However, these latter students did show improvement on recall of story detail. The findings of these studies indicated that even students with severe learning disabilities can profit from instruction focused on abstract, higher-order comprehension when it is geared to their particular instructional requirements.

From these findings one can see that positive effects of an intervention are most likely to be seen on measures that are rather closely aligned to the specific instruction provided. Typically, there is a problem when it comes to transfer effects; generalization to measures that are less specifically tied to the intervention goals is notoriously difficult to achieve, especially when working with students with learning disabilities or other poor readers.

Fuchs and Fuchs (1994), for example, evaluated performance of students whose teachers incorporated either many or few story grammar questions into their instruction. Measures related to the intervention, such as retelling, which assesses the ability to organize and remember important story information, and the Stanford Achievement Test, which involves reading passages and

answering multiple-choice questions, showed intervention effects. However, the teachers' use of story grammar questions had no effect on oral reading fluency, a measure that was less related to the intervention.

Organizing Classrooms to Deliver Strategy Instruction

A good example of a research program that has gone beyond the evaluation of the effects of a single strategy to the design of a comprehensive classroom package is PALS (Peer-Assisted Learning Strategies). PALS is described by Fuchs, Fuchs, Mathes, and Simmons (1997) as a classwide on-to-one peer-tutoring program involving partner reading, paragraph summary, prediction, and other such activities to encourage students to practice strategies that have been shown to strengthen reading comprehension. The program is the result of extensive earlier work on classwide peer tutoring (Simmons, Fuchs, Fuchs, Hodge, & Mathes, 1994; Simmons, Fuchs, Fuchs, Mathes, & Hodge, 1995). In the 1997 study cited above, 20 teachers implemented PALS for 15 weeks, and another 20 teachers did not implement it. Students in the PALS classrooms demonstrated greater reading progress on all three measures of reading achievement used: words read correctly during a read-aloud, comprehension questions answered correctly, missing words identified correctly in a cloze (maze) test. The program was effective not only for students with learning disabilities but also for non-disabled students, both low achievers and average achievers.

CHAPTER 4

IMPROVING COMPREHENSION OF EXPOSITORY TEXT

As students with learning disabilities move into fourth grade, they are expected to read expository text with understanding. This is a genre that requires more effort and more skill, and the task represents a real challenge for many students with learning disabilities. Interventions for helping students with expository text are necessarily considerably more elaborated than are many of the interventions focused on narrative text. We hope that future advances in research and development at this earlier level will, if not obviate the need for remediation later, make the transition from narrative to expository text smoother.

Research clearly shows that students with learning disabilities are less competent than normally achieving peers at using text-structure strategies that underlie effective comprehension of expository text. For example, Wong and Wilson (1984) showed that, compared to normally developing children, students with learning disabilities were less aware of passage organization and had more difficulty reorganizing disorganized passages. In a related way, Taylor and Williams (1983) showed that deviant sentences late in a paragraph did not help students with learning disabilities as they did normal readers. With respect to comprehension, Wong (1980) found that learning-disabled readers recalled as many main ideas as normal peers when questions were used to prompt responses, but performed worse when recalls were elicited without organizing questions. Hansen (1978) found that students with learning disabilities did not recall as much superordinate information (although the two groups performed comparably in terms of the amount of subordinate information they recalled).

In extending this work, Englert and Thomas (1987) demonstrated not only that students with learning disabilities lacked sensitivity to text structure, but also that this unawareness affected their capacity to understand expository material. Students with learning disabilities performed worse in terms of formulating hypotheses about upcoming details based on interrelationships communicated by text structure; they could not distinguish between essential and nonessential material; and they were insensitive to comprehension failures because they did not generate expectations as they read. These findings emerged even when the comparison group comprised low-achieving, non-learning-disabled classmates matched on reading level and IQ, and even when the text was read aloud to the students to preclude comprehension problems stemming from decoding difficulties.

In light of these findings, it is not surprising that children with learning disabilities have more difficulty learning about text structure. Day and Zajakowski (1991), for example, demonstrated that youngsters with learning disabilities required more instruction than did average readers to learn how to identify main ideas under non-ideal text structures. Nevertheless, as Wong and Wilson (1984) showed, with appropriate opportunity, students with learning disabilities can learn to sort disorganized sentences into coherent clusters around respective subtopics and, with instruction, they

appear to understand what constitutes an organized paragraph. Clearly, students with learning disabilities require and may profit from C carefully guided instruction in extracting key information from expository text. Unfortunately, conventional instruction provided to students with learning disabilities may not focus adequately on helping these children develop the strategies necessary for extracting information from expository material, strategies that are required for independent adult life (Englert & Thomas, 1987). Below, we focus on two methods that researchers have developed and tested to correct this problem.

Training of Strategies for Reading Expository Text

As readers progress through school, the demands and expectations placed on them change, even as their own cognitive abilities develop. At the early grades, teachers rely heavily on stories for reading instruction, practice, and experience (Nichols, 1995; Wilson & Rupley, 1997).

By contrast, as children enter the fourth grade, teachers increasingly expect students to work with expository material (i.e., to read books with factual material about history, science, geography, science, social studies, and other disciplines (Wilson & Rupley, 1997)). In fact, most reading beyond the primary grades involves expository text as does most adult reading necessary to succeed at work and everyday life (Stanovich, 1994). Science, technology knowledge, and knowledge of basic economic and social science principles, acquired largely by reading expository material, is increasing in importance as American society becomes technologically more advanced (Lapp, Flood, & Ranck-Buhr, 1995).

Unfortunately, expository text often presents information-dense content, with frequently unfamiliar technical vocabulary. Students must often perform fairly high-level and complex cognitive processes to extract, summarize, and synthesize this information (Lapp et al., 1995). Compared to most stories, expository material almost always poses greater challenges for readers (Hidi & Hildyard, 1983; McCutchen & Perfetti, 1982), for at least three reasons. First, as Bereiter and Scardamalia (1981) note, expository text involves reading long stretches of material without prompts from a conversational partner. This is at odds both with narrative text, where dialogues are interspersed frequently, and with children's oral language experiences, in which arguments or discussion occur within the context of conversations. Second, as Stein and Trabasso (1981) suggested, the logical-causal arguments typical of expository text are more abstract and therefore less familiar and memorable than the goal-directed events that characterize narratives. Third, and the reason that has received the most attention in the field of reading comprehension, is that expository materials use more complicated and more varied text structures than do stories. Furthermore, one chapter from an expository text often uses several different text structures. For these reasons, attempts to use text structure knowledge to improve the comprehension abilities of students without disabilities has been fraught with problems (Beck, 1997; Armbruster, Anderson, & Ostertag, 1987; Anderson & Roit, 1993; Pressley, 1997).

Ironically, use of the standard expository text structures has been a source of a wide array of effective interventions to enhance the writing abilities of students with and without disabilities

(Englert et al., 1991). They also have been used to develop promising instructional interventions for teaching social studies to students with learning disabilities (Carnine et al., 1996).

Five major structures in expository material, identified by Meyer and Freedle (1984), are: (1) *description*, which groups content by association; (2) *collection*, which includes more than one grouping by association and may include a sequencing of elements by time; (3) *causation*, which introduces a third organizational component beyond grouping and sequence, whereby causal links between elements are embedded; (4) *problem/solution,*[1] which adds organization structures that relate a solution as a cause of a problem; and (5) *compare/contrast*, which may have many organizational components, depending on how many similarities and differences are presented.

Currently, therefore, corroborating evidence suggests that capacity to comprehend expository text may be related to the complexity of the text structures used by the authors, as well as students capacity for strategic processing (Wilson & Rupley, 1997). Unfortunately, textbook reading in the intermediate grades often is introduced without adequate instruction about how to derive information effectively from text (Yore, 1986). Researchers, therefore, have focused intervention work on two related efforts: (1) adapting text material to make its structure more simple and transparent to readers; and (2) making strategic processing of text more visible for students so they can practice and become more proficient with the strategic behaviors strong readers evidence.

In this section, we review the small number of studies that attempt to assist students with learning disabilities to become more strategic readers of expository text. Later, we review the research on text adaptation. In this section, we describe the methods researchers have developed to adapt materials to make expository text structure and content more salient and memorable for students with disabilities.

First, we review the strategy-building research. These studies appear in Exhibit 4.

[1] Called Problem-Solution-Effect by Carnine and his colleagues.

EXHIBIT 4
Studies on Improving Comprehension of Expository Text

Chan, L. K. S. (1991). Promoting strategy generalization through self-instructional training in students with reading disabilities. *Journal of Learning Disabilities, 24*, 427-433.

Englert, C. S., & Mariage, T. V. (1991). Making students partners in the comprehension process: Organizing the reading "POSSE." *Learning Disability Quarterly, 14*, 123-138.

Labercane, G., & Battle, J. (1987). Cognitive processing strategies, self-esteem, and reading comprehension of learning disabled students. *B.C. Journal of Special Education, 11*, 167-185.

Malone, L. D., & Mastropieri, M. A. (1992). Reading comprehension instruction: Summarization and self-monitoring training for students with learning disabilities. *Exceptional Children, 58*, 270-279.

Mastropieri, M. G., Scruggs, T. E., Hamilton, S. L., Wolfe, S., Whedon, C., & Canevaro, A. (1996). Promoting thinking skills of students with learning disabilities: Effects on recall and comprehension of expository prose. *Exceptionality, 6*, 1-11.

McCormick, S., & Cooper, J. O. (1991). Can SW3R facilitate secondary learning disabled students' literal comprehension of expository test? Three experiments. *Reading Psychology: An International Quarterly, 12*, 239-271.

Nelson, J. R., Smith, D. J., & Dodd, J. M. (1992). The effects of a summary skills strategy to students identified as learning disabled on their comprehension of science text. *Education and Treatment of Children, 15*, 228-243.

Schumaker, J., Deshler, D., Alley, G., Warner, M., & Denton, P. (1984). Multipass: A learning strategy for improving reading comprehension. *Learning Disability Quarterly, 5*, 295-304.

Swanson, H. L., Kozleski, E., & Stegink, P. (1987). Disabled readers' processing of prose: Do any processes change because of intervention? *Psychology in the Schools, 24*, 378-384.

Wong, B. Y. L., & Wilson, M. (1984). Investigating awareness of and teaching passage organization in learning disabled children. *Journal of Learning Disabilities, 17*, 477-482

Before beginning, however, we offer two caveats. The first caveat is that text structure and readers' strategic behavior are only two factors associated with the comprehension of expository text. Two additional, major contributors to students' understanding of expository material are the world knowledge and specific topic information children bring to the text, as well as their capacity to decode that text. In other words, in this section, we attend to only one of the three aspects in the Kolligian and Sternberg framework described in Chapter 2, *Understanding Reading Comprehension Difficulties of Students with Learning Disabilities.*

In this section, however, we do not address these components for the following reasons. With respect to prior knowledge, research has been criticized for its failure to explain how readers acquire that information and its related failure to provide clear implications for reading intervention (Bransford, 1984). In terms of decoding, recent work in reading disability has focused considerable effort on the development of decoding capacity among students with disabilities; by contrast, the

focus of this report is enhancing the comprehension of text among children for whom the challenge of decoding has been addressed.

The second caveat we offer is that most of the work we describe focuses on students with learning disabilities. Although our search was comprehensive in terms of types of disabilities, we failed to uncover much relevant work dedicated specifically to students with other types of disabilities. We return to this issue in the conclusion of this report.

Interventions to Improve Students' Strategic Reading Behavior

The major method investigated for enhancing student comprehension of expository text has been strategy instruction. In contrast to an approach that focuses on adapting text, strategy instruction presumes that readers will need to cope with whatever text they encounter. Consequently, rather than circumvent, modify, or supplement text, the focus of strategy instruction is to improve how readers attack expository material so that they can become more deliberate and active in their processing of text. In this section, we first present investigations of single strategies and then discuss studies of multiple strategies.

Before describing this literature, we note that some of the strategies we describe below actually incorporated use of visual-spatial aids. The key difference between the studies we described in the materials adaptations and those we include in this strategies section is this: If the visual-spatial aid incorporated information specific to passage content (e.g., listing vocabulary or key questions pertaining to a passage), we categorized the study as materials adaptations. If, on the other hand, the visual-spatial aid was generic (i.e., containing no passage-specific information, but rather applicable to the organization of *any* expository passage), we categorized the study as strategies. Consequently, although the work of Bos et al. as well as that of Bulgren et al. incorporated some features of strategy instruction, we categorized that work under materials adaptations because the researchers' visual-spatial aids contained content specific to the passages they employed.

Effects of Single Strategies

Studies of single strategies on students' reading comprehension of expository text examined the use of passage organization training, a mapping organizer, an elaborative interrogation strategy, SQ3R, generalization induction, and summary skills training. In an early investigation, Wong and Wilson (1984) taught 21 fifth- and sixth- graders with learning disabilities, who had demonstrated difficulty with disorganized passages, a five-step strategy for reorganizing text: sort the sentences, check the sentences, put the sentences in the right order in each paragraph, and get ready to tell the story. After the experimenter demonstrated this strategy, the student applied it to two practice passages, and the experimenter provided corrective feedback. Then, the child reorganized, studied, and retold one disorganized test passage. Students not only reorganized this final passage to criterion levels of performance, but also retold more C compared to their own previous retellings with

organized and disorganized passages. The effects were clear. Nevertheless, the study was laboratory-like, conducted in a short time frame, with no demonstration of classroom applicability or maintenance over time.

In a more robust test of a circumscribed strategy, applied under laboratory-like conditions, Swanson, Kozleski, and Stegink (1987) examined the effectiveness of a mapping organizer on the strategic reading behavior and reading comprehension performance of two adolescents with learning disabilities. Having been taught to write main ideas and supporting idea units on maps, students were instructed to take notes on those maps during tape-recorded presentations of passages. The purpose of this generic visual-spatial aid was to guide learners in building a coherent outline of the text. Outcomes included an analysis of the students' strategic behavior, recall performance on training passages, and answers to short questions related to novel passages. With training in the mapping strategy, students' strategic behavior improved, even though the nature of the enhanced strategic behavior did not correspond specifically to the treatment. Moreover, although recall performance on the trained passages increased, no effects were demonstrated on the transfer passages, which had not been the focus of the instructional sessions.

In another laboratory-like investigation, this time looking at an elaborative interrogation strategy, Mastropieri, Scruggs, Hamilton, Wolfe, Whedon, and Canevaro (1996) taught seventh- and eighth-grade students with learning disabilities to reason actively through information presented in each sentence (p. 1). At the end of each sentence within passages on facts about vertebrate animals, students were told to ask themselves, Why does that make sense? In individual sessions, the experimenter modeled self-questioning and coached the student through several examples. After this introduction, students were asked to apply the strategy as they read. Experimental students produced significantly more correct explanations of information, but did not recall more information from those passages. The authors concluded that more intensive, direct coaching, prompting, and guided practice may be necessary to realize intended effects.

Chan's (1991) findings corroborate this possibility. Fifth- and sixth-graders with reading disabilities were taught in small groups to ask themselves three to five questions for four different topics: deleting redundant information, deleting trivial information, locating topic sentences, and identifying main ideas. Half the children participated in a standard instruction condition, in which they were provided with a demonstration of how to ask themselves the designated set of questions while reading a passage and how to look for answers; then, the children practiced the strategy on their own. The other half were in a generalization induction condition, which incorporated cognitive modeling, overt external guidance, overt self-guidance, faded self-guidance, and covert self-guidance. In line with Mastropieri et al.'s (1996) speculation, the more extensive teacher mediation of the strategy exerted an important effect on students' capacity to identify main ideas independently: Although students in both conditions improved their identification of the main ideas when prompted to do so, students in the generalization induction condition performed better than those in the standard instruction condition during unprompted sessions. Unfortunately, because no control group was used, we do not know whether students performed better than comparable students might have performed as a function of simple practice.

In accord with Mastropieri et al.'s (1996) speculation and Chan's (1991) findings, two additional studies of single-strategy instruction incorporated greater teacher mediation of strategy practice: one with greater success than the other. McCormick and Cooper (1991) incorporated teacher-directed lessons of SQ3R, a well-known and strongly advocated study approach for expository text. SQ3R involves surveying passages; formulating questions about titles and subheadings; reading, reciting, or restating the details found under each subheading; and reviewing by self-testing one's own memory of the information contained in each subheading. Despite teacher-directed lessons that ensured student application of the strategy, SQ3R failed to effect superior recall among high-school, adjudicated students with learning disabilities. The authors concluded that SQ3R may not have been sufficiently powerful to counter the difficulties with text structure associated with expository material, combined with the text-processing problems experienced by the students. Nevertheless, the lack of effects is surprising given that the time-series data used to evaluate treatment effects were collected on the very passages employed for the teacher-directed lessons.

Using the most comprehensive teacher-support structure in this series of studies on single strategies, Nelson, Smith, and Dodd (1992) examined the effects of a summarization strategy on five elementary-age special education children within the context of a summer remedial program. They documented positive results. These researchers taught children a two-component, nine-step summary skills strategy, in conjunction with a Summary Writing Guide that visually organized the students application of the strategy. Importantly, teachers taught students to use this strategy in a careful manner. The teacher emphasized the purpose and importance of the strategy; described the steps in the strategy and the reason for each step; modeled use of the strategy; and provided students with opportunities to describe and practice the strategy. In every instructional session, the teacher followed a three-part teaching script, in which every step of the strategy was reviewed and modeled; then, guided practice was provided. To engage students actively, the teacher used self-instruction statements, encouraged students to help the teacher, and often discussed the importance of "thinking to themselves" while reading and completing summaries. In this single-subject design study, students generated summaries and completed short reading comprehension tests at the end of each session. As with McCormick and Cooper, the data were collected in conjunction with the instructional sessions; in contrast to McCormick and Cooper, the data persuasively demonstrate improvement on both outcomes as a function of the training.

What can we conclude from these studies of single-strategy instruction? One pattern in the database suggests the potential importance of careful teacher mediation of strategy instruction, which makes overt the process of applying that strategy and provides carefully structured practice opportunities to students, with systematic fading of teacher support. In fact, the most persuasive effects in the database, demonstrated by Nelson et al. (1992), might have accrued because of this type of teacher mediation. Unfortunately, due to Nelson et al.'s addition of a generic visual-graphic aid, which helped students apply the strategy, and because strategies differed from McCormick and Cooper's study, it is unclear to what Nelson et al.'s superior outcomes might be attributed. Moreover, Nelson et al. demonstrated these effects on measures that were related proximally to instructional sessions; so, little about maintenance and transfer effects can be inferred. Other researchers in this set of studies, which incorporated stronger tests of their treatment (i.e., Mastropieri et al., 1996; Swanson et al., 1987), failed to demonstrate persuasive effects on measures related more distally to training sessions. Consequently, the database on single skill strategy instruction for students with disabilities is small (i.e., six studies dedicated to expository text); it provides only tentative support

for the potential importance of careful teacher mediation; and it does not persuasively demonstrate the capacity to achieve transfer effects.

Studies Evaluating Multiple Strategies

As with single-strategy investigations, studies evaluating multiple strategies incorporate a range of different strategies, examine alternative outcome measures that represent a continuum in terms of their proximity to training conditions, and vary in terms of their laboratory-like features. Most importantly (and probably relatedly), these studies offer inconsistent findings.

Combined summarization with self-monitoring training, Malone and Mastropieri (1992) contrasted this two-component treatment to a summarization-only and a control condition. Students with learning disabilities were trained on narrative text. Recall measures were administered two days after training using three types of novel passages that had not been used during instructional sessions: "Post-test of training" measures were narrative passages into which lines had been inserted (as was done during training) to prompt students to generate summaries; "near-transfer" measures were narrative passages with no inserted lines; and the "far-transfer" measures were expository social studies passages. Both treatment groups outperformed controls on all measures; the only difference between the two treatment groups favored the performance of the combined method condition on the far-transfer expository text. Malone and Mastropieri attributed this one difference to the superior demands of expository text, which may have required the addition of a self-monitoring treatment to help students apply the summarization strategy.

The potential effects of interventions combining a greater number of strategies, each implemented with carefully structured teacher guidance, were tested for expository text in four additional studies C with varying degrees of success. Schumaker, Deshler, Alley, Warner, and Denton (1984) designed and tested the MULTIPASS strategy. MULTIPASS requires three "passes" through expository material. With the survey pass, students become familiar with the main ideas and organization by reading the chapter title, reading the introductory paragraph, reviewing the chapter's relationship to adjacent chapters, reading major subtitles, looking at illustrations and captions, reading the summary paragraph, and paraphrasing information acquired in the process. With the size-up pass, students gain specific information and facts without complete reading. They read each question at the chapter s end; if they could already answer it, they checked where in the text the answer could be found. Then, they progressed through the chapter looking for textual cues, transforming cues into questions, skimming surrounding text to find answers to questions, and paraphrasing answers. With the sort-out pass, students tested themselves by reading each question at the chapter's end and answering it. If students could answer a question immediately, they checked it; if not, students sought an answer by identifying which section of the answer might be found and skimming that section (as often as needed, until the answer was found).

Schumaker et al. had teachers instruct students in the use of this three-part strategy during individual teaching sessions with the following procedure. First, teachers described and provided a rationale for each step of the strategy; then, they modeled the strategy while "thinking aloud." Next, they required students to rehearse the strategy verbally until 100-percent criterion

performance was achieved. Then, they provided practice and feedback on controlled, instructional level material. Finally, they provided practice and feedback on grade-level materials. Schumaker et al. showed that students performed substantially better on 20-item tests of expository materials, in both instructional and grade-appropriate material, after having been taught this comprehensive strategy.

In the remaining three studies, each research group also implemented a multiple-component strategy intervention with carefully designed instruction. In contrast to Schumaker et al.'s (1984) treatment, however, these remaining studies all relied on peer-mediation to transfer control of the strategies in a gradual fashion from the teacher to the students.

Englert and Mariage (1991), for example, developed a generic graphic organizer to correspond to a multifaceted strategic process for use with fourth-, fifth-, and sixth-grade students with learning disabilities. This POSSE treatment used a strategic-processing graphic organizer in combination with the following set of strategies: *p*redicting ideas, **o**rganizing predicted ideas and background knowledge based on text structure, *s*earching for the text structure, *s*ummarizing the main ideas, and *e*valuating comprehension. Teachers modeled how to use these strategies with the graphic organizer, while gradually transferring control for the dialogue supporting use of these strategies to the students.

Although lesson dialogues showed that the students with learning disabilities had not fully internalized the strategies in the two-month treatment, the children did increase their strategy knowledge more than did control students, especially in classrooms where teachers did a good job of transferring control for the dialogue to the students. Moreover, regardless of teachers' transfer of control, students performed better than comparable controls on recall measures of novel expository passages (which were read to students during testing). Consequently, compared to much of the work already reviewed, Englert and Mariage (1991) constructed a relatively comprehensive treatment, which involved (1) a generic graphic organizer and (2) student- and peer-mediated instruction with (3) a variety of strategic processing behaviors focused carefully on text structure. With these methods in place, these researchers demonstrated impressive transfer effects to novel text, which had not been used instructionally.

Given these encouraging findings, we expected to find strong effects for the procedurally rich and conceptually related Reciprocal Teaching treatment. Designed by Palincsar and Brown (1984), Reciprocal Teaching incorporates use of four strategies: asking questions, summarizing, predicting what might be discussed next in the passage, and clarifying any confusing content. As with Englert and Mariage (1991), Reciprocal Teaching relies on student mediation of dialogues (after teacher introduction, modeling, and gradual shifting of control), which supports students by making the strategies visible to peers and helping classmates use and practice those strategies. Most work on Reciprocal Teaching has focused on expository text. Unfortunately, most studies looking at expository text functioning, including those of Palincsar and colleagues, have not examined effects for students with disabilities.

By contrast, Labercane and Battle (1987) implemented 28 Reciprocal Teaching sessions over 14 weeks to test effects with 12 intermediate-grade boys and girls with learning disabilities. They contrasted the performance of these students to that of a control group of 10 boys. These

researchers failed to identify significant effects on the Gates-MacGinitie. Although the authors speculated that the lack of differences might be attributed to the difficulty of the Gates-MacGinitie, reliable effects also failed to accrue on the Ekwall Informal Reading Inventory.

Nevertheless, as estimated by Rosenshine and Meister (1994), Labercane and Battle's (1987) effect size on the Gates MacGinitie was a respectable .36 standard deviation. Moreover, as Rosenshine and Meister reported, an additional study of Reciprocal Teaching (Levin, 1989) achieved statistically significant effects on the Stanford Achievement Test for intermediate-age students with learning disabilities, when implementation occurred over 50 sessions (no estimate of effect size was provided due to inadequate statistical information provided in the research report). Consequently, other reasons, such as small sample size or relatively short treatment, may explain Labercane and Battle's failure to demonstrate statistically significant effects.

CHAPTER 5

INTERVENTIONS FOCUSED ON ADAPTING TEXT

Instead of attempting to design interventions that will improve a student's comprehension ability, some investigators have turned their attention to the nature of the texts that the students must read. In this approach, certain characteristics of text that contribute to comprehension difficulties are identified, and those characteristics modified, in order to make text more "considerate" (i.e., more adapted to the needs of readers). In a variation of this approach, no modification of the text is made, but some type of supplementary material to aid comprehension is added. There has been substantial work along these lines with both adults and children, indicating that text can indeed be made more comprehensible. Various ways of reorganizing a text so that its structure is simpler and clearer have been proposed, for example.

With respect to children, the goal of this type of work has been primarily to improve recall and comprehension of content-area texts such as those used in science and social-science curricula. Most of the studies have therefore dealt with expository, not narrative, text.

One major approach to enhancing learning-disabled students comprehension of expository text is to provide them with adapted material. Most of this research occurs in junior and high school classrooms where, to obtain the passing grades necessary to earn a diploma, students are required to extract and then remember the critical pieces of information embedded within poorly organized, information-dense, inconsiderate textbooks (Kantor, Anderson, & Armbruster, 1983; Lovitt & Horton, 1994).

One typical distinction between the materials adaptation and strategy instruction methods is the type of outcome of interest to the researchers. In the materials-adaptation literature, outcomes typically tend to be restricted to learning of the very passages students used during treatment (notable exceptions to this rule exist; see, for example, Darch and colleagues as well as Mosby). By contrast, the strategy-instruction literature more typically evaluates its effects by examining student performance in novel passages that were not used as part of treatments (although, as shown later, notable exceptions to this rule also exist within the strategy instruction literature).

Across researchers, the nature of material adaptations varies. Some adaptations are dramatic, involving complete or near-circumvention of existing classroom reading material; others supplement textbook reading material. Some are simple to implement; others require teachers to posses high levels of creativity and to dedicate large amounts of time. Most have been shown to enhance extraction and retention of critical information contained in the adapted material; few have demonstrated transfer effects to novel material that have not been adapted for students.

In this section, we provide an overview of the research base on materials adaptations and means to increase the quality and quantity of interactive instruction for students with learning disabilities.

We organize our presentation in terms of the ease with which practitioners might make use of the adaptation approach within everyday classroom life. We begin with methods by which existing materials are replaced entirely.

Circumventions

We identified five studies in which the materials adaptations might be categorized as circumventions, or replacements, of school text. These studies are listed in Exhibit 5. In each case, the researchers determined that to more effectively teach scientific or social-science content to students with learning disabilities, it was best to spend more time in some form of interactive instruction prior to asking the student to independently read the passage. In other words, the text was circumvented (i.e., replaced by some form of focused or interactive teaching of either relevant background knowledge or of conceptual frameworks that were deemed critical for understanding the material the text conveyed).

EXHIBIT 5
Studies on Circumventions or Replacements of School Text

Abrahamsen, E. P., & Shelton, E. (1989). Reading comprehension in adolescents with learning disabilities: Semantic and syntactic effects. *Journal of Learning Disabilities*, 22, 569-572.

Horton, S. V., Lovitt, T. C., Givens, A., & Nelson, R. (1989). Teaching social studies to high school students with academic handicaps in a mainstream setting: Effects of a computerized study guide. *Journal of Learning Disabilities*, 22, 102-107.

Lindsey, J. D. (1983). Effects of learning goal attainability level, text organization, and age level on learning disabled adolescents' silent reading comprehension. *Education and Treatment of Children, 6,* 165-173.

MacArthur, C. A., & Haynes, J. B. (1995). Student assistant for learning from text (SALT): A hypermedia reading aid. *Journal of Learning Disabilities, 28,* 150-159.

Mosby, R. J. (1979). A bypass program of supportive instruction for secondary students with learning disabilities. *Journal of Learning Disabilities, 12*(3), 54-57.

Mosby (1979) examined a "developmental bypass" technique, whereby textbooks and classroom tests were tape-recorded so that high school students with learning disabilities could listen, rather than read, the school's texts. Students were pre- and post-tested on the social-studies portion of the Stanford Achievement Test, administered with and without audio recordings; students' first- and fourth-quarter grades were collected. Although Mosby found no improvement on grades, he documented that approximately three-fifths of the sample learned some social studies (i.e., had reliably higher post- than pretest scores) as shown on audio administrations of the achievement test. Results, however, are difficult to interpret because no control group was employed.

Two more recent, but related, materials circumventions relied on more sophisticated technology, which permitted greater flexibility in presentation formats; these studies also relied on stronger evaluation designs. Horton, Lovitt, Givens, and Nelson (1989) replaced typical high school reading materials with computerized aids that supplemented text with study guides. In the most sophisticated technological application, MacArthur and Haynes (1995) added to existing expository text the following features: speech synthesis, an on-line glossary, links between questions and text, highlighting of main ideas, and supplementary explanations that summarized important ideas. Both computer applications resulted in enhanced comprehension of expository text among the adolescents with learning disabilities.

Two additional studies (Abrahamsen & Shelton, 1989; Lindsey, 1983) required students to read paper-pencil expository material, but examined how rewriting that text to make it more simple and accessible would affect comprehension. Lindsey evaluated student recall of expository material when text was written in dispersed (rather than non-dispersed) form; he found no difference in performance among adolescents with learning disabilities. By contrast, Abrahamsen and Shelton documented that high school students with learning disabilities answered more comprehension questions correctly after having read content area passages with combined semantic and syntactic modifications and with syntactic modifications alone.

As shown in these five studies, attempts to replace expository material with more accessible versions of that prose, either via improved access by supplementary media or by rewriting that material, have met with mixed results. Use of a listening mode, whereby students avoid reading entirely, was associated with learning for only a subset of students with learning disabilities, and the lack of appropriate controls makes it impossible to attribute that learning specifically to the treatment (Mosby, 1979). On the one hand, it is unfortunate that this is the only study examining a listening adaptation, because overviews of adaptation strategies often include the recommendation that teachers transfer textbook content to audiotape. On the other hand, lack of overwhelming success for this adaptation may not be surprising given that research (e.g., Englert & Thomas, 1987) demonstrates how students with learning disabilities manifest difficulty with expository text structures even when those students listen to, rather than read, the material and that the nature of that difficulty may reside with students' problems with text structure, rather than with decoding problems.

More intrusive modifications, which require rewriting text, may therefore produce better comprehension. As shown in the studies described, although rewritten text in non-dispersed form had no effect on reading comprehension (Lindsey, 1983), syntactic modifications, such as changing passive voice constructions to the active voice, changing past perfect tenses to the simple past, and clarifying pronoun antecedents by eliminating relative clauses, enhanced students' capacity to answer simple questions. However, as might be predicted from research demonstrating the importance of expository text structure to student comprehension, attempts to replace existing text with computerized materials that specifically highlight text structure as well as salient content appear more uniformly successful (Horton et al., 1989; MacArthur & Haynes, 1995).

Of course, each of these relatively dramatic modifications probably has poor generalizability to everyday classroom life: It is unlikely that even highly dedicated teachers will have sufficient time either to audiotape classroom text or to rewrite that material, and computerized supplements to high

school curriculum materials, although promising, have not yet materialized. Moreover, in everyday adult life, individuals are unlikely to have access to these types of adaptations; so, we can expect little transfer to extra-school situations. In light of these feasibility problems, along with the scant database and inconsistent findings for some of these methods, circumvention of high school expository text does not appear to be a promising avenue for helping students with learning disabilities learn content area material, to achieve high school graduation, or to develop stronger capacity for dealing with expository material outside of school.

Supplementary Organizational Materials with Visual/Spatial Features

A second category of materials adaptations, used to supplement rather than replace existing textbooks, involves supplementary materials with visual/spatial features. A fair amount of literature exists in this category. One strategy for making sense of this relatively large database is to separate (1) approaches designed to help students identify and organize salient, from less important, expository content from (2) Mastropieri and Scruggs large body of work focusing more narrowly on mnemonic strategies for enhancing memorization of vocabulary and key concepts.

Graphic Techniques for Organizing and Identifying Critical Information

A second approach to supplementary, organizing materials that highlights visual-spatial features can be conceptualized as graphic techniques for organizing and identifying the most critical material contained within dense expository content. We identified three types of treatments within this approach, which had been tested with students with disabilities: graphic organizers, semantic-feature analysis, and concept diagrams.

Almost invariably, the visual spatial displays are used as a means to dramatically increase the amount of focused, active teaching of the central ideas and concepts in the passage prior to reading. Thus, these are not studies of reading comprehension, but rather studies of methods for improving acquisition of science and social studies content for students with learning disabilities by using more interactive teaching methods than are typical in classrooms. The studies reviewed related to graphic techniques for organizing and identifying critical information are listed in Exhibit 6.

EXHIBIT 6

Studies on Graphic Techniques for Organizing and Identifying Critical Information

Bergerud, D., Lovitt, T. C., & Horton, W. (1988). The effectiveness of textbook adaptations in life science for high school students with learning disabilities. *Journal of Learning Disabilities, 21*(2), 70-76.

Darch, C., & Carnine, D. (1986). Teaching content area material to learning disabled students. *Exceptional Children, 53*, 240-246.

Darch, C., & Eaves, R. C. (1986). Visual displays to increase comprehension of high school learning-disabled students. *The Journal of Special Education, 20*, 309-318.

Griffin, C. C., Simmons, D. C., & Kameenui, E. J. (1991). Investigating the effectiveness of graphic organizer instruction on the comprehension and recall of science content by students with learning disabilities. *Reading, Writing, and Learning Disabilities, 7*, 355-376.

Horton, S. V., Lovitt, T. C., & Bergerud, D. (1990). The effectiveness of graphic organizers for three classifications of secondary students in content area classes. *Journal of Learning Disabilities, 23*(1), 12-22, 29.

Graphic Organizers

Underlying the use of graphic organizers is the notion that the structure of a diagram can help students consolidate information and literally see the big picture. Their purpose is to help students avoid processing text in the fragmented fashion that is so typical for students with learning disabilities, to see relationships between the terms, facts, or concepts in the passage, and to alert students to the interrelationships among ideas and representing the logical connections among ideas.

Horton and colleagues (Bergerud, Lovitt, & Horton, 1988; Horton, Lovitt, & Bergerud, 1990) used graphic organizers for secondary students with learning disabilities. Bergerud et al. contrasted self-study to graphic organizers and to study guides (i.e., an orienting list of 20 questions highlighting the most salient material in the text) with science textbook material. In the classrooms of two of three participating teachers, graphic organizers were superior to self-study and to study guides, with no difference detected between the self-study and the study guide treatments (in the third classroom, there were no significant differences among conditions). As shown in additional analyses reported by Bergerud et al., however, results were mediated by the type of question posed on the learning measures: Some questions were framed graphically; others as text. And, as might be expected, the study guide condition resulted in superior performance on the text items, whereas the graphic condition produced better performance on the graphic items.

In a series of three studies reported in 1990, Horton et al. documented more consistent findings favoring graphic organizers. Among middle- and high-school students with learning disabilities, these researchers found that, compared to self-study, teacher-directed use of graphic organizers and student-directed graphic organizers with text references both produced superior learning from text. In these studies, however, the measures of learning were proximal to the treatments; for example, in at least one (and possibly all three) of the studies, the outcome measure was the students' version (i.e., the uncompleted diagram) of the graphic organizer.

Darch and colleagues (Darch & Carnine, 1986; Darch & Eaves, 1986) developed visual spatial displays (i.e., graphic organizers presented in the form of visual spatial displays) to enhance the comprehension of important information with adolescent and intermediate-age students with learning disabilities. With both age groups, they found that students performed better than counterparts in a conventional text-reading condition on short-term recall measures involving a variety of instructional topics. There were, however, no effects on a transfer test, and the high school students also failed to maintain the content.

Griffin, Simmons, and Kameenui (1991) evaluated the effectiveness of graphic organizers with fifth- and sixth-graders with learning disabilities. On a variety of comprehension measures (i.e., oral free retell, short-answer production responses, and multiple-choice response tests), students in the graphic organizer condition performed better than did students in a "list-of-facts" treatment. Those differences, however, were not significant.

Semantic Features Analysis

A similar method, which relies on visual-spatial devices to organize expository text, is semantic-feature analysis. With this approach, somewhat more emphasis is placed on linking students current knowledge with the material to be learned.

As described by Bos and colleagues (Bos, Anders, Filip, & Jaffe, 1989; Bos & Anders, 1990), semantic-feature analysis involves the use of a relationship matrix that lists the important ideas of a passage as columns and lists the important vocabulary in a passage as rows. This chart is used in the following way. First, a teacher-researcher and the students discuss and cooperatively complete the relationship chart in an effort to activate and initiate students' prior knowledge and to predict relationships between new and old knowledge as represented by the concepts and vocabulary in the chart. Second, to fill in the boxes in the matrix, definitions are either generated by students or provided by the teacher-researcher. Third, students predict the relationship between the vocabulary and each important idea, rating each relationship as positive, negative, nonexistent, or unknown. Fourth, participants discuss these predictions, and consensus is achieved. Sixth, once the chart is completed, students read the related passage to confirm predictions and clarify unknown relationships. Finally, after reading, discussion occurs to clarify relationships previously rated as unknown and to modify disconfirmed relationships. Studies examining semantic features analysis are listed in Exhibit 7.

EXHIBIT 7

Studies on Semantic Features Analysis

Bos, C. S., & Anders, P. L. (1990). Effects of interactive vocabulary instruction on the vocabulary learning and reading comprehension of junior-high learning disabled students. *Learning Disability Quarterly, 13*, 31-42.

Bos, C. S., Anders, P. L., Filip, D., & Jaffe, L. E. (1989). The effects of an interactive instructional strategy for enhancing reading comprehension and content area learning for students with learning disabilities. *Journal of Learning Disabilities, 22*, 384-390.

Bulgren, J., Schumaker, J. B., & Deshler, D. D. (1988). Effectiveness of a concept teaching routine in enhancing the performance of learning disabled students in secondary-level mainstream classes. *Learning Disabilities Quarterly, 11*, 3-17.

This method was examined for students with learning disabilities in two studies conducted by Bos and colleagues. In both studies, the semantic-features analysis treatment was compared to a dictionary-method condition, in which students use dictionaries to write a definition and sentence for each word; read the passage to verify and clarify meanings; and then modify definitions as necessary. Bos, Anders, Filip, and Jaffe (1989) showed that, on immediate and follow-up multiple-choice tests of learning and retention of vocabulary and conceptual items in the text, students in the semantic-feature analysis condition scored higher than did students in the dictionary-method condition.

In a subsequent study, Bos and Anders (1990) contrasted three related versions of semantic-feature analysis (semantic-feature analysis vs. semantic mapping vs. semantic/syntactic-features analysis) to the dictionary method. These researchers categorized the three related conditions as "interactive," because students discussed their application of the relationship chart. Learning was assessed with multiple-choice as well as recall measures. Results showed that students in all three interactive strategy conditions performed comparably than those in the dictionary condition on the multiple-choice measure; the written recalls were longer and qualitatively better for students in the semantic-feature and the semantic/syntactic-feature analysis conditions, but only at follow-up testing one month after treatment. Effects were demonstrated only for measures that corresponded to passages used during instruction.

In a study of a method related to semantic-feature analysis, Bulgren, Schumaker, and Deshler (1988) investigated the effectiveness of a concepts diagram and a related concept teaching routine among 32 ninth-grade students with disabilities. The concepts diagram, prepared by the teacher, highlighted interrelationships among key concepts from the chapter. The concept teaching routine involved providing an advance organizer; eliciting a list of key words from the chapter and writing those words on the board; reviewing the symbols in the concept diagram; naming and defining the concept; discussing the always , sometimes , and never characteristics; discussing one example and one non-example of each concept; linking the example and the non-example to each characteristic; testing potential examples and non-examples; and providing a post-organizer. Bulgren et al. found that, compared to baseline, this intervention produced gains in performance on tests of concept acquisition, on regularly scheduled unit tests, and in note-taking when the concept teaching routine was used in classrooms.

In summarizing the research on visual-spatial devices that organize expository content for students, we offer the following observations. Although the effectiveness of graphic organizers appears mixed, two findings emerge across studies. First, results seem to be mediated by the proximity of the outcome measures to the treatments: More favorable results occur when the

measure of learning corresponds strongly and closely to the content or format of the graphic organizers. Transfer effects to novel material, on the other hand, seem elusive.

A second pattern, evident across studies, offers some distinction among the varying forms of visual-spatial supplementary aids. Although many of the treatments described in this literature provided some forms of instruction to students about how to apply the graphic aid to the expository material, the intensity and form of that instruction differed by approach. That is, compared to the graphic organizer treatments, the semantic-feature analysis and the concept-diagram methods incorporated greater support and more elaborated dialogues among students about applying the visual-spatial materials. It is, therefore, interesting that more consistently positive results accrued, at least on the proximal outcome measures, for those approaches that incorporated more elaborated instruction. Elaborated instruction, in conjunction with the graphic adapted materials, may represent one key to success.

Nevertheless, it is important to note that documented effects are still limited to proximal reading material on which students have already operated during structured instruction using an organizing aid specifically tailored to that reading material. Moreover, feasibility issues about teachers' capacity to create these materials need to be resolved. As Lovitt and Horton (1994) describe, The biggest problem in adapting materials ... is that many teachers, particularly those at the secondary level where there is the greatest need for modifications, are not inclined to do so (p. 114).

Non-graphic, Supplementary Adapted Materials Aids

Non-graphic, supplementary aids may be conceptualized as advance organizers, which are designed to help students orient toward the essential text information presented later in test items. We identified three studies that examined the effects of non-graphic supplementary aids. Studies on non-graphic, supplementary aids are listed in Exhibit 8.

EXHIBIT 8

Studies on Non-graphic, Supplementary Adapted Materials Aids

Darch, C., & Gersten, R. (1986). Direction-setting activities in reading comprehension: A comparison of two approaches. *Learning Disability Quarterly, 9,* 235-243.

Horton, S. V., & Lovitt, T. C. (1989). Using study guides with three classifications of secondary students. *The Journal of Special Education, 22,* 447-462.

Kameenui, E. J., Simmons, D. C., & Darch, C. B. (1987). LD children's comprehension of selected textual features: Effects of proximity of information. *Learning Disability Quarterly, 10,* 237-248.

Lovitt, T., Rudest, J., Jenkins, J., Pious, C., & Benedetti, D. (1986). Adapting science materials for regular and learning disabled seventh graders. *Remedial and Special Education, 7*(1), 31-39.

Rose T. L., & Robinson, H. H. (1984). Effects of illustrations on learning disabled students' reading performance. *Learning Disability Quarterly, 7*, 165-171.

Rose, T. L. (1986). Effects of illustrations on reading comprehension of learning disabled students. *Journal of Learning Disabilities, 19*, 542-544.

Darch and Gersten (1986) investigated the use of advance organizers with high school students with learning disabilities. The advance organizers consisted of an outline, which provided an overview of the important facts and concepts, while also showing the relationship among these components. The teacher structured the students' use of the advance organizer based on a direct instruction approach; this was designed to engage students actively in use of the advance organizer by requiring students to answer questions that relied on the advance organizer. This treatment, compared to a basal reading groups lesson format, produce superior performance on multiple-choice unit tests as well as a multiple-choice posttest that corresponded directly to the expository text covered in the treatment sessions.

In a similar way, Horton and Lovitt (1989) tested the effectiveness of study guides. Middle- and high-school students with learning disabilities were provided with the study guides, which comprised 15 short-answer questions based on main ideas from the beginning, middle, and end of science and social-studies text. In one study, students used these materials independently; in a second study, students used materials with teacher-directed instruction, which required them to complete the study guide in conjunction with the lesson. Compared to independent self-study, students remembered more on short-answer measures that tapped the very information asked in the study guide questions. Interestingly, the middle-school students with learning disabilities with study guides performed better in the independent condition than with teacher-directed instruction; the authors concluded that the process of completing the study guide while the teacher wrote answers on an overhead projector may have been taxing for the younger students.

Lovitt, Rudest, Jenkins, Pious, and Benedetti (1986) tested the effects of framed outlines and vocabulary sheets among seventh-graders with learning disabilities in the area of science. These outlines identified key vocabulary items in a chapter and presented students with 10 to 12 sections of the expository text in a logical sequence. Students filled in blanks in the text, choosing among the key vocabulary listed at the top of the page; then, they checked responses against an answer key. Students took a 24- to 29-item "objective" test published by the curriculum developer; they also wrote as many facts about each chapter as they could in two minutes. Results showed that students performed better with adapted, than non-adapted, materials on the former measures; there were no significant differences between the adapted and non-adapted conditions on the latter measure.

These studies largely serve to corroborate results from the investigations of graphic supplementary aids. It appears that non-graphic supplementary adapted materials can help students remember the material covered in the expository text to which the supplementary aid corresponds. No evidence, however, has been provided that, as a function of using these supplementary aids, students with learning disabilities develop capacity to process novel expository text more profitably

than when they have no access to study guides or advance organizers others have created for them. On the positive side, however, these non-graphic, supplementary aids are easier for teachers to create because: (1) no artwork is involved; and (2) the materials, which typically are limited to the presentation of main ideas or vocabulary, do not require teachers to highlight interrelationships among ideas. For these reasons, non-graphic aids have greater applicability for everyday classrooms.

There is one way of modifying texts, however, that seems as relevant to narrative text as to expository text, and as relevant to younger as to older students. Stories can be presented with or without illustrations, and the value of illustrations has been a rather popular topic. Only a couple of studies were found that focused specifically on students with disabilities. Rose and Robinson (1984) asked elementary-school students with learning disabilities to read stories both with and without the multicolor large illustrations that originally appeared with the stories, all of which consisted of an explicit depiction of the main idea or of a significant story event. A series of comprehension questions followed each story. There was no clear relationship between the presence or absence of illustrations and oral reading rate, nor was there a relationship between illustrations and comprehension.

In 1986, Rose did a larger study involving 32 elementary-school students with learning disabilities, using similar materials. This time, there was a significant effect: the students understood non-illustrated stories better. In fact, not one student performed better on the illustrated passages. This result replicates findings of studies done on other populations, and the explanation is usually that illustrations distract the reader's attention from the critical characteristics of the printed word. Indeed, this effect might be even stronger in children with learning disabilities, since many of them have a difficult time filtering out extraneous stimuli (i.e., they are distractible). While illustrations may well have positive motivating effects, perhaps it would be wise to remove them from materials used in beginning and remedial reading materials.

An interesting approach to the issue of the actual modification of text, also using narrative text, was taken by Kameenui, Simmons, and Darch (1987). Most such studies (in which the investigators have worked with expository prose) have manipulated the overall organization of the text and have found that: (1) making a text conform to the canonical (prototypical) organization for its genre; and (2) adding explicit wording that cues the reader to the organization (e.g., "next," "therefore," etc.) help to make a text more comprehensible. Kameenui et al., however, took a slightly different approach. Quoting McConaughy (1985) that the "ability to concentrate on important or thematically relevant material to the exclusion of nonessential material" is a critical skill in understanding text, Kameenui et al. (1987) pointed out that what is deemed important is not always evident, especially to poor and disabled readers. They predicted that children with learning disabilities would be more likely to overlook the important information in a text if the critical pieces of information were widely dispersed among the text propositions rather than being presented in close proximity.

Stories with a clear hierarchical structure that contained explicit goal statements, important information, and unimportant information (distracting or irrelevant) were given to students with learning disabilities whose ages ranged from 10 to 12. The stories were presented either with this information dispersed among the other story propositions or presented in close proximity.

Performance on comprehension questions was significantly better when the pieces of critical information were presented close together, as expected. But the authors also noted that even when stories were presented with the critical propositions in immediate contiguity, the students performed at a very low level. Moreover, even though each participant was given six stories with the same hierarchical structure, those successive exposures did not lead to increased sensitivity to the structure over the course of the study. The authors argue that these children need more explicit means of identifying, connecting, and applying prioritized textual information.

Mnemonics

Scruggs and Mastropieri's impressive program of research examines how mnemonic strategies can be used to help students with learning disabilities remember the science and history vocabulary items and key concepts critical for their success in school. Mnemonic instruction improves recall by systematically integrating specific retrieval routes within the content to be learned. Numerous studies document the remarkable potential of mnemonic instruction for special education when those methods are applied in laboratory-like settings with experimental content such as vocabulary lists and brief lists of facts (e.g., Berry, 1986; Mastropieri, Scruggs, & Levin, 1985, 1987). Work also demonstrates that mnemonic instruction can be used to teach students with disabilities abstract as well as concrete material and that it aids comprehension and recall (Mastropieri, Scruggs, & Fulk, 1990; Scruggs, Mastropieri, McLoone, Levin, & Morrison, 1987). Studies on the use of mnemonics are listed in Exhibit 9.

EXHIBIT 9
Studies on Mnemonics

Mastropieri, M. G., & Scruggs, T. E. (1988). Increasing the content area learning of learning disabled students: Research implementation. *Learning Disabilities Research, 4,* 17-25.

Mastropieri, M. G., Scruggs, T. E., Whittaker, M. E. S., & Bakken, J. P. (1994). Applications of mnemonic strategies with students with mild mental disabilities. *Remedial and Special Education, 15*(1), 34-43.

Rosenheck, M. B., Finch, M. E., & Levin, J. R. (1987, April). *Comparison of mnemonic and taxonomic science-learning strategies.* Paper presented at the meeting of the American Educational Research Association, Washington, DC.

Scruggs, T. E., & Mastropieri, M. G. (1989). Reconstructive elaborations: A model for content area learning. *American Educational Research Journal,* 26, 311-327.

Scruggs, T. W., & Mastropieri, M. G. (1992). Classroom applications of mnemonic instruction: Application, maintenance, and generalization. *Exceptional Children, 58,* 219-229.

Moreover, more recent studies have moved mnemonic instruction outside the laboratory, into classrooms, with similar success using materials adapted from regularly assigned textbooks. For example, Scruggs and Mastropieri (1989) taught adolescents with mild disabilities information about World War I using materials embedded with mnemonics and contrasted learning with mnemonics present to learning with conventional drill-and-practice. Students with mnemonic present recalled substantially more content than students taught via conventional methods, and students maintained advantages recalling information over a delay of three to four days.

Of course, a major question in this research program concerns students' transfer of mnemonics strategies to novel content. Findings are mixed. Mastropieri and Scruggs (1988) found no evidence of spontaneous strategy transfer after 2 or even 6 weeks of daily mnemonics instruction. Nevertheless, as Scruggs and Mastropieri (1992) and Mastropieri, Scruggs, Whittaker, and Bakken (1994) demonstrated, students with disabilities can be taught and encouraged to transfer those methods to novel material even though their learning rates are less impressive when they rely on their own, rather than experimenter-created, mnemonics.

Consequently, mnemonics represents one validated method for enhancing recall of key vocabulary and critical concepts among students with mild disabilities. Moreover, although this notion has not been tested directly for students with disabilities, Rosenheck, Finch, and Levin (1987) showed that college students who were provided with a mnemonic strategy for studying a plant taxonomy not only remembered more plant definitions and relationships than did their non-mnemonic-strategy counterparts, but also applied that information better in problem solving. Consequently, mnemonically acquired factual material transferred from its original context to a novel one. Of course, given the demonstrated difficulties students with disabilities have with knowledge application and transfer, it may be difficult to demonstrate parallel effects among special education populations.

Another limitation with a mnemonic approach is that it can be difficult for everyday teachers to develop their own mnemonic instructional materials because of the creative, analytical, and artistic demands associated with the development of effective devices. This suggests that publishers might need to incorporate this instructional feature into their commercial materials before widespread adoption can be achieved.

CHAPTER 6

INTERVENTIONS FOCUSING ON OTHER ASPECTS OF READING

Children are introduced to meaningful text, of course (stories, for the most part), when they first come to school. But this is at a time when they have not mastered the rudiments of reading. So it is not surprising that one important type of intervention has consisted of providing training in aspects of reading that relate to basic skills.

Under this rubric we find a variety of instructional techniques. The theoretical rationale for most of them can be described in terms of an information-processing paradigm. According to this point of view, a student who is not yet proficient in reading must allocate some portion of his attention to accurate decoding. Sometimes little attention remains available for comprehending what is read. As fluency increases, decoding becomes an automatic process; that is, much less attention is required for decoding, and more attention may be allocated to comprehension (LaBerge & Samuels, 1974). Thus the information-processing model suggests that if decoding is improved and fluency achieved, comprehension should increase. Studies reviewed in this section are listed in Exhibit 10.

EXHIBIT 10

Studies of Interventions Focused on Improving Other Aspects of Reading to Improve Comprehension

Armstrong, S. W. (1983). The effects of material difficulty upon learning disabled children's oral reading and reading comprehension. *Learning Disability Quarterly, 6*, 339-348.

Fleisher, L. S., & Jenkins, J. R. (1983). The effect of word- and comprehension-emphasis instruction on reading performance. *Learning Disability Quarterly, 6*, 146-154.

Jenkins, J. R., Barksdale, A., & Clinton, L. (1978). Improving reading comprehension and oral reading: Generalizations across behaviors, settings, and times. *Journal of Learning Disabilities, 10*, 5-15.

Jenkins, J. R., Larson, K., & Fleisher, L. S. (1983). Effects of oral reading error corrections on word recognition and reading comprehension. *Learning Disability Quarterly, 6*, 139-154.

Pany, D., & McCoy, K.M. (1988). Effects of corrective feedback on word accuracy and reading comprehension of readers with learning disabilities. *Journal of Learning Disabilities, 21*, 546-550.

Pany, D., Jenkins, J. R., & Schreck, J. (1982). Vocabulary instruction: Effects on word knowledge and reading comprehension. *Learning Disability Quarterly, 5*, 202-215.

Rashotte, C. A., & Torgesen, J. K. (1985). Repeated reading and reading fluency in learning disabled children. *Reading Research Quarterly, 20*, 617-621.

Samuels, S. J. (1979). The method of repeated readings. *The Reading Teacher, 32*, 403-408.
Sindelar, P. T., Monda, L. E., & O'Shea, L. J. (1990). Effects of repeated readings on instructional- and mastery-level readers. *Journal of Educational Research, 83*, 220-226.

Word Recognition

One group of studies falling into this category focuses on word-recognition training. Many studies of this type have not met with much success (i.e., disabled readers' comprehension has not been affected by word training). But Jenkins, Larsen, and Fleisher (1983) compared the effects of two error-correction procedures on the comprehension of students with learning disabilities: word drill, an intervention that put maximum emphasis on accurate word reading, and word supply, which put only moderate emphasis on accurate word reading. They found that the word-drill treatment was superior; however, they used as a dependent measure only sentence comprehension, and their comprehension questions related specifically to the words that had been trained.

Still, the results were promising, and Fleisher and Jenkins (1983) undertook a similar study with greater ecological validity. They compared Jenkins et al.'s (1983) treatment involving word drill and error correction with a treatment emphasizing comprehension, working with a population of fourth- and fifth-grade students with learning disabilities. In the word-drill treatment, fourth- and fifth-grade students read stories aloud from a third-grade basal reader. All oral reading errors were corrected, after which the student repeated the word. The words that were stumbled over were used in daily drills. In the treatment emphasizing comprehension, after the student read the story aloud, comprehension questions were asked. If an answer was incorrect, the student was directed to the portion of the text that contained the answer. If the student still could not answer the question, he was told the answer. There was also a third condition, which combined both word drill and emphasis on comprehension.

Results indicated that, as in many other studies, reading comprehension, as assessed by a set of 12 comprehension questions asked at the end of each story (nine literal and three that required synthesis of information), did not improve. However, the word drills did improve the recognition of newly introduced words but only when they were presented in isolation, not when they were presented in context. The authors point out that some theorists, like Goodman (1982), believe that instruction that emphasizes the word level might well impair comprehension. From that perspective, one could consider the fact that this study showed no adverse effects of word-emphasis training as a positive finding.

In a later study in the same vein (Pany & McCoy, 1988), third-grade students with disabilities read stories at a second-grade readability level. Three treatments were used. In the treatment involving total feedback, students were given immediate feedback on all oral reading errors. Feedback followed a hierarchy of prompts. In treatment involving feedback on changed meaning, the same hierarchy of prompts was used but was selectively applied only to errors judged as altering the

meaning of the sentence. In the third treatment, no feedback was given. There were eight days of training.

In this study, as in the previous one, corrective feedback on oral reading errors had a positive effect on word recognition, but unlike the previous study, it also had a positive effect on comprehension. This positive effect was seen on several measures: overall errors made during reading, meaning-change errors during reading, errors on lists of words on which there had been errors made (both on immediate and delayed testing), and errors on comprehension questions. In addition, the number of story retell units recalled tended to be greater under the conditions of corrective feedback, and total feedback tended to have more of an effect than partial feedback; but these effects did not reach significance. Thus the results of this study go beyond those of the previous one: not only does teacher-supplied corrective feedback not interfere with comprehension, it may well have a beneficial effect on the comprehension of students with learning disabilities.

Of course, these conclusions must be tempered by the fact that the passages used in the study were relatively short (about 300 words) and that the difficulty level of the passages was held at a 10-percent error rate. It might be that if the passages had either higher or lower error rates, feedback effects might have been very different.

Fluency

The rationale for a focus on developing fluency in reading is similar to that of the studies that emphasize instruction in word recognition: if too much attention must be allocated to low-level processes, not enough attention remains to accomplish the higher-order processing involved in comprehension. Some studies have investigated rate of reading. In an early study by Jenkins, Barksdale, and Clinton (1978), reinforcement (money) was made contingent on reading rate; this procedure increased the reading rate of three boys with learning disabilities. However, there was no transfer of training to comprehension performance (nor was there any detrimental effect on comprehension performance). Another treatment consisted of comprehension training, which was also effective but did not transfer to reading rate. The two skills appeared not to be linked.

But later studies have been somewhat more optimistic. Armstrong (1983), for example, did a more elaborate study. Boys with learning disabilities were given a one-page story at an easy reading level and another at a more difficult reading level. (The levels had been predetermined for each student individually on the basis of number of words read correctly per minute.) Students read the stories aloud and then silently, and then they answered comprehension questions. Reading rate was higher and comprehension was superior on the easy story. This study suggested that oral reading measures and reading comprehension performance are indeed linked, a conclusion that has also been reached by many other researchers.

Another technique, having a student read a text over and over again, has been given a great deal of attention. This technique is called "repeated readings ; it was introduced by Samuels (1979) as an instructional treatment suggested by the Laberge and Samuels (1974) model of the role of attention in reading. The repeated readings make for automatic decoding of the passage, and the

improved accuracy and fluency led to improved comprehension. It is, of course, more of a challenge (and more important in terms of adopting this technique in actual instruction) to demonstrate that such training with repeated readings will lead to improvements in performance in passages that have not been practiced. Rashotte and Jorgesen (1985) showed that, for students with learning disabilities, such generalization from one passage to another depends on the number of words that the passages have in common. When passage overlap is minimal, the Rashotte and Torgesen data indicated no greater effects from four readings of the same passage than from reading each of four different passages once.

Sindelar, Monda, and O Shea (1990) compared the effects of repeated readings for students with learning disabilities and non-disabled students matched on reading ability. Screening measures were reading rate, errors made in oral reading, and story propositions retold (as a comprehension measure). Participants read third-grade stories at one of two difficulty levels, either a mastery level (faster than 100 words per minute) or an instructional level (between 50 and 100 words per minute), and they read them either once or three times. The screening measures were repeated at posttest. Both reading rate and recall were better after three readings than after one reading, and the effects of repeated readings were comparable for both disabled and non-disabled readers. Also, the effects of repeated readings were effective for students reading at both the mastery and the instructional levels. These findings corroborate the Laberge and Samuels model underlying the method and provide strong support for the use of repeated readings in instruction.

Vocabulary

A somewhat different instructional treatment, but still on the level of the word, was investigated by Pany, Jenkins, and Schreck (1982). These authors were interested in the effects of vocabulary instruction, and in a series of experiments, they compared several treatments that varied in the amount of direct instruction. In one treatment, meanings from context, there was no direct instruction on word meanings. Students read two sentences, the first containing a target word, the second containing a synonym of the target word. In the treatment with meanings given, students read one sentence containing the target word, and then they read the meaning of the target word plus a sample sentence that included that word. In the treatment with meanings practiced, students read a single target word and were given a synonym and a sample sentence using the target word; the students reviewed and practiced the words and meanings, with corrective feedback, until they had mastered them. There was also a control with no meanings.

Six students with learning disabilities in the fourth, fifth, and sixth grades participated in the study. Results indicated that the practice condition was the most effective procedure for teaching synonyms. The given treatment also showed some effects, but they were considerably weaker. Context showed no appreciable synonym learning. On dependent measures assessing sentence comprehension, the treatments lined up in the same order, thus demonstrating transfer from the vocabulary training to comprehension. Moreover, the students clearly benefited from increases in the amount of direct instruction that they were provided.

An important question, of course, is whether these findings would be similar on more typical comprehension measures, namely, passage comprehension. In a follow-up study designed to answer this question (reported in the same article), fourth-grade students with learning disabilities learned 12 target words according to the practice treatment used in the previous study and also received 12 target words as control words, which the students read during training but with no synonyms provided. A short battery of post-tests was administered. On vocabulary post-tests, there was a significant difference, as would be expected, between the instructed words and the control words. Moreover, these results transferred to sentence comprehension tests, as they had in the previous study. The authors underscored the importance of this training effect: the students had had only about an hour of instruction (across a two- or three-day period). Most of the students acquired 12 new vocabulary words within this time, and they also retained their knowledge of the words until the following day's delayed test.

However, results were less encouraging on the measures of text comprehension. In one test in the battery, students answered comprehension questions whose answers were the experimental target words. On this test, there was a difference in favor of the trained words. But on two general measures of reading comprehension, a close test and a story-retell test, the vocabulary instruction had no effect. It may be that the training was not long enough to effect transfer to prose passages, or it might be that training that provided deeper processing would be necessary to see an effect. Vocabulary is notoriously difficult to teach. Another point raised by the authors was that it might not be so important for students to understand the meaning of every word in a story if the story is familiar; their general understanding of the topic and of the structure of a story will suffice. This is not an unusual point of view. In fact, over the last several years, vocabulary instruction has not been given much prominence in intervention studies of reading comprehension, whether students with learning disabilities or other students are being targeted.

CHAPTER 7

CONCLUSIONS

Contemporary Trends and Issues in Comprehension Research with Relevance for Students with Learning Disabilities

Instructional research in reading comprehension remains a relatively new field. As with many new fields, the first decade or two of research results in numerous and rapid shifts in conceptual frameworks used to understand the process, as well as shifts in the language we use in this case to describe instruction and the impacts of instruction. Recently, these shifts have been the subject of numerous important conceptual papers (Kucan & Beck, 1997; Beck, 1997; Pressley, Harris, & Marks, 1992; DeWitz, 1997; Palincsar & Klenk, 1992, 1993; Englert, Tarrant, & Marriage, 1992), several of which deal directly with special education students.

We will briefly describe the shifts in the language used to describe comprehension instruction, reasons for the shifts and implications for practice. Although these very recent reconcpetualizations have not yet been reflected in special education research, we believe they have profound implications for both future research and improvement of current practice. Therefore, in this section, we briefly describe the linkage between the shifts in comprehension instruction and contemporary theories. We follow with a summary of the major findings from our review of the existing LD research literature.

The Complex and Shifting Language of Comprehension Research

Comprehension instruction is an attempt to teach students how to think while they read. It therefore makes sense that for many years, we struggled to find the right language to describe and operationalize how we teach thinking.

As instructional researchers began to address reading comprehension in the 1980s, the field needed to begin developing a language for describing aspects of comprehension instruction. By and large, the research community came to realize that the early language of skill-building and task analysis did not fully capture the nature of what transpired during comprehension instruction. Increasingly, researchers borrowed terminology from cognitive psychology, especially after the

publication of the seminal research study by Palincsar and Brown (1984). Researchers spoke of teaching students two facets of reading comprehension:

- The strategies and procedures used by proficient readers, and
- Knowledge of the different types of text structures.

The idea was to help students who were poor comprehenders develop a plan of action based on our knowledge of what proficient readers do, and how people organize information they have read (i.e. text structures). From the beginning, researchers were aware that they needed not only to teach students the strategies of more proficient readers, but also to help students understand when to use the strategies and how to use them in a flexible, personalized fashion. Thus, researchers faced a daunting task, and one for which earlier research traditions of direct or explicit instruction provided little guidance. Our review of the research on learning disabilities indicates that transfer and application were often weak.

Recurring Problems and Issues in Comprehension Research

Even from the earliest years of research, concerns emerged. For example, many hoped that text structures (e.g., story grammar, compare-contrast, problem-solution, cause-effect, explanation) would form the core of instructional interventions. In fact, many of the intervention studies reviewed relied on explicit teaching of text structure knowledge to students with learning disabilities.

Yet it became clear that many texts that students read do not easily fit into one of the text structures. For example, Gurney et al. (1990) were forced to examine numerous short stories before finding a select number that fit the story grammar mode. The situation for expository text is far more difficult. This explains, in part, the reason so many special education writers attempted to circumvent or drastically adapt or rewrite texts. As Dimino and Kolar (1990) and Armbruster, Anderson, and Ostertag (1987) noted, many of the expository texts that students read tend to have a mixed text structure (i.e., some cause-effect, but a good deal of explanation or sequence). Also, the most prevalent text structures, explanation and sequence, are the ones that lead to least deep processing and thus are less likely to help students structure their learning. This problem has led to frequent implementation problems with early versions of strategy instruction in reading comprehension (e.g., Armbruster et al., 1987).

Another major concern was determining the best means for conveying to less proficient readers the strategies used by more proficient readers. From the onset, it seemed awkward to formally teach these strategies to students in a didactic fashion. At best, these strategies are crude approximations of steps used occasionally by some expert readers. As Resnick (1987, cited in Kucan and Beck, 1997) noted, there is no evidence that proficient readers actually use these overt self-conscious strategies (p. 27) in a systematic way. Thus, she pondered whether the effectiveness of the type of strategy instruction discussed in many of the studies reviewed in this report was attributable largely to the fact that cognitive strategy instruction forces students to read in a more thoughtful fashion. This issue of what transpires during strategy instruction that enhances learning has yet to be resolved.

Teaching students how to flexibly use reading comprehension strategies has proved to be a challenge (Pressley et al., 1992), requiring great ingenuity and flexibility on the part of teachers. Furthermore, some have argued that these formulations of what competent readers do were a good starting point for researchers, but ultimately became stifling. In essence, they were too contrived.

Shifts in Language To Help Conceptualize Shifts in Understanding

Because of this concern with flexibility in teaching comprehension to students, as early as the mid-1980s, many researchers made a shift in the language used to describe comprehension interventions. The term *scaffold* often replaced cognitive strategy, or was used interchangeably with it, but implied more flexible and fluid teaching than cognitive strategy instruction. The goal of most scaffolds is to encourage elaborated dialogue (MacArthur and Haynes, 1995). Typically, students with learning disabilities tend not to engage in this type of elaboration without extensive coaching and prompting and support. According to Kucan and Beck (1997), the major purpose of all cognitive strategies is to encourage students to think aloud about what they have read, because as we verbalize our thoughts, we clarify our thoughts, and we become more aware of what we are sure of and what we are unsure of.

Researchers like Beck (1997) and Palincsar and Brown (1984) moved to a more flexible approach to teaching students to be more thoughtful and reflective while they read. The steps in reciprocal teaching are broad, generic, and merely serve as *generic facilitators* to help teachers prompt their students to read more carefully, to paraphrase occasionally, to predict and see if their predictions are validated by the material in the text, to ask themselves questions while they read, to stop and re-read if something is unclear, and to learn to ask for help. As noted in the previous sections, we are still unclear as to the efficacy of teaching generic facilitators to students with learning disabilities. In essence, these were attempts to actively encourage students to *think aloud* about what they had read, in the hopes that students would increasingly think *as they read.*

A significant shift resulting from the greater degree of flexibility in teaching, and noted by Pressley et al. (1992), was the move away from teaching one strategy at a time towards simultaneous teaching of multiple strategies. Concomitant with this shift was a movement away from using teacher modeling, guided practice, and then independent student practice (as in the pioneering research of Idol) towards teaching of these multiple strategies in a looser, more opportunistic fashion that built on students existing meaning-making repertoires and were more attuned to particular contexts, purposes, and texts (Kucan & Beck, 1997).

As this research evolved, it became increasingly obvious that work with peers was critical for encouragement of thinking aloud. Thinking aloud with a peer or group of peers is more natural than doing so with a teacher in a formal setting. Even in the earliest research on story grammar (Idol, 1987), heterogeneous groups were used to promote interactive dialogue about text. Often, as in the case of the Idol studies, students were also provided with facilitators to both stimulate and organize dialogue. Palincsar et al. (1991) noted how she felt that more loosely structured, collaborative group work on making sense of text was preferable to the more formulaic reciprocal teaching she had used earlier. As we previously noted, there has been, in fact, little research on reciprocal teaching with

students with disabilities, and empirical support for use of collaborative problem solving as a tool for improving comprehension abilities of students with learning disabilities is scant at the current time.

Brown and Palincsar (1989, cited in Kucan and Beck, 1997) characterize conceptualizations that stress the social aspect of learning and collaborative learning as seductive, but raise questions regarding the extent to which social collaborations lead to independent competence (p. 397). In other words, the extent to which each individual student in the collaborative group is better able to comprehend text when reading independently remains unclear.

With our knowledge that many students with learning disabilities fail to capitalize on strategies or organizational frameworks that are presented in an implicit fashion, one needs to question and further study exactly what are the long and short time impacts of collaborative interactive group comprehension instruction on students with learning disabilities. It may well be that a combination of these highly flexible, dynamic group discussions with the more formalized comprehension strategies described in the many intervention studies reviewed in this report is the optimal mix.

A final issue that recurs is the importance of task persistence in comprehending expository text. Increasingly, theorists such as Sternberg and DeWitz and empirical researchers such as McKinney, Osborne, and Schulte, (1993) are citing that the role of task persistence may be as important or more important than knowledge of cognitive and metacognitive strategies in making sense out of complex expository text. Any techniques or instructional arrangements such as classwide peer tutoring that increase students opportunities to verbalize, and to receive feedback and/or encouragement from peers, may well have a salutary effect on comprehension performance. Similarly, the various scaffolds and organizers described in the preceding sections may help students persevere in the sometimes arduous, often nebulous task of comprehension of text, because students see a big picture, can see how the pieces fit together, and may simply see that there is an end in sight.

Summary of Findings from Learning Disabilities Research

Much of the research reviewed in this report emanated from the 1980s, an era when instructional researchers were beginning to apply findings from cognitive science into applied classroom research. Special education researchers were in the vanguard conducting this type of research.

Although some of the conceptualizations that guided this body of research appear a bit quaint to a contemporary audience, we conclude that this was a fertile body of research, with strong implications for improving current practice. A wide array of approaches appear to be effective; many include graphic or visual organizers to help students see relationships. Virtually all of the

instructional approaches attempt to help students learn the processes or strategies that proficient readers use.

Given that stories are the first texts offered to beginning readers, it is not surprising that a substantial portion of the research conducted with students with learning disabilities was in the area of narrative comprehension. All of the interventions attempted to make students more active readers of stories. The strategies taught encouraged formulation of inferences about what students read. These research studies have demonstrated some success; transfer and application remains, as always, a particular hurdle for researchers and developers.

It appears that a comprehensive approach to strategy instruction, which incorporates multiple strategies along with carefully structured instruction and peer-mediated practice in applying those strategies, represents the most promising intervention methods for enhancing the comprehension of *expository* text among students with disabilities. Of course, the research literature is not as consistent as one might hope. Moreover, the connection between learning these strategies and becoming a better comprehender of expository text on a routine basis has yet to be firmly established.

The research base is unclear as to which is the best approach to select. Further research is necessary to untangle the essential elements of effective comprehension instruction. Nonetheless, a major conclusion we drew is that students with learning disabilities can and should be taught an array of strategies or methods to enhance their understanding of what they read.

A major issue confronted by the researchers was that it is easier to teach a comprehension strategy to a child with disabilities than it is to support its routine use. Use of comprehension strategies is complicated, since each of the rules taught in the intervention studies have many exceptions. All are, at best, crude approximations of what proficient readers actually do. However, these studies do indicate that in many instances, the interventions led to increased use of strategies when students confronted new text. This is particularly true for narrative text.

In contrast, we found a paucity of studies dealing with improving students comprehension of expository text. We feel this is unfortunate because for adults, reading expository texts, such as newspapers, technical or procedural manuals, and voters pamphlets, with understanding, is essential for work and other participation in society.

In understanding the research we believe it is critical to differentiate between studies that build comprehension ability and those that help students learn particular content in science or social studies. In our view, the latter group of studies are not comprehension studies although these studies of text adaptation or circumvention of text are important in helping students comprehend. These studies tend to indicate that an array of devices can help teachers more effectively present content to students in a more interactive and organized fashion, and that to teach scientific and social science content to students with learning disabilities is often superior to relying on independent reading of the text.

Text circumventions and text adaptations may be effective means of conveying specific information to students with learning disabilities. There is, however, no evidence that these methods

enhance students capacity to process unfamiliar expository text independently. Because so much reading material in adult life is expository, research is needed to investigate methods for enhancing students capacity with this type of material. However, the research clearly indicates that these students need other kinds of activities to enhance their own capacity to read scientific or technical material independently.

Several issues are of current concern in research on comprehension; these have a direct bearing on the studies reviewed. The first is the issue of whether comprehension should ever be broken down into a series of steps. Some prominent comprehension researchers (e.g. Beck, 1997) argue that more fluid discussion of text, where the teacher models the wide array of strategies and tools that good readers use to make sense of text, is a superior means to direct or explicit instruction in strategies.

Another issue the field is now confronting relates to the relative benefits and drawbacks of using peers to teach or foster comprehension strategies (Vadasy et al., 1997; Fuchs et al., 1997). A drawback to the use of peers is that they may not have the verbal facility to adequately explain to a peer exactly what they do as they figure out the meaning of what they read. A potential advantage of the use of peers is that their language is likely to be more easily understandable than the more formal language of an adult.

Ultimately the research seems to suggest that an array of strategies promote deep processing of text (Anderson & Pearson, 1984; Armbruster et al., 1987). In fact, our synthesis suggests that using multiple strategies with peer mediation might be the most effective approach to take.

In summary, strategy instruction appears promising. It appears that an array of strategies can promote students becoming more active readers and more interactive readers (i.e., readers who generate hypotheses implicit in the text and ask themselves questions about what they are reading as they read). There are, however, relatively few studies with students with disabilities in the expository area. Moreover, the evidence is not overwhelmingly positive, especially with respect to transfer (i.e., material not read as part of intervention). Use of multiple strategies, use of peer-mediated or socially mediated instruction to support routine use of the strategies, appear to be the most promising directions.

Clearly, a rich and ambitious research program will be required before practitioners have clear guidance about how to improve the comprehension of expository text among students with disabilities. Transfer effects require additional study. Information is needed about how often and how long treatments must be implemented. Research is necessary to determine how teachers can be supported to implement relatively complex interventions, which often incorporate strategies that they rarely are cognizant of using in their own reading activities (Pressley, 1997). And, research populations that can expand findings to broader groups of students with disabilities, beyond those with learning disabilities, must be studied.

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SECTION II

READING COMPREHENSION RESEARCH FOR STUDENTS WITH LOW INCIDENCE DISABILITIES

CHAPTER 1

INTRODUCTION

The vast majority of research on reading in students with low-incidence disabilities has focused on issues of sight word recognition, phonemic awareness, visual perception, and the role of speech in reading. Only a few studies directly address components or processes of reading comprehension. Additionally, and with rare exception (e.g., Worthy & Invernizzi, 1995), the research in this area is driven by underlying assumptions about disability rather than theories of reading comprehension or instruction. For example, visual perception and auditory skills, speech production, and phonology have been studied almost exclusively in children with cerebral palsy, who often have impaired speech, hearing, and vision. On the other hand, cognition and memory have been studied almost exclusively in children with mental retardation. Finally, studies documenting hyperlexia dominate the literature in autism to the near exclusion of reading comprehension and instruction.

Information in this section of the report reflects a narrative synthesis of available research on reading comprehension among students with low-incidence disabilities. We featured mainly intervention research on students with different types of low-incidence disabilities. For example, we considered research on (a) students with cognitive disabilities, such as individuals with mental retardation or autism; (b) students with sensory disabilities, such as individuals who are deaf or heard of hearing; and (c) children with multiple disabilities, such as individuals with cerebral palsy who are deaf or blind. Thus, this section considered research on a wide range of students with different strengths and a variety of special needs, as compared to Section I, which emphasized reading comprehension research on one group, namely children with learning disabilities.

We also attempted to focus the synthesis on students with low-incidence disabilities who, research suggests, often have difficulty learning to read. For example, we considered intervention research on two groups with poor reading outcomes: (a) students with developmental disabilities (e.g., Wolery & Haring, 1994) and (b) students who are deaf (e.g., Lowenbraun & Thompson, 1994). Both groups of students have greater reading difficulty than other students with low-incidence disabilities, such as individuals who are blind or with low vision (e.g., Sacks & Rosen, 1994). Accordingly, the synthesis featured information about what we know (or need to know) to improve reading outcomes among students with low-incidence disabilities, especially among individuals with developmental disabilities and individuals who are deaf or hard of hearing.

The remainder of this introductory chapter provides a discussion of the background issues and methodology we followed in synthesizing reading comprehension research on children with low-incidence disabilities.

Background

Although there are innumerable differences between specific populations and among individual students, students with developmental disabilities and students who are deaf experience significant difficulties in acquiring language and learning to communicate. Some students with low-incidence disabilities (e.g., individuals who are blind) have patterns of language development that are similar to their non-disabled classmates (Bigelow, 1990). In contrast, students with developmental disabilities and students who are deaf often have specific language and communication needs, and thus benefit from intensive interventions, such as long-term speech-language services (Watkins, 1987) as well as from augmentative communication devices (Baumgart, Johnson, & Helmstetter, 1990).

Most important, for this synthesis, students with developmental disabilities or students who are deaf have much greater difficulty than their non-disabled peers in learning to read. The National Adult Literacy Survey (Kirsch, Jungeblut, Jenkins, & Kolstad, 1993), for example, reports that 21-23 percent of adults in the general population perform at the lowest level of literacy proficiency. However, the figures more than double for adults with physical disabilities (44-47 percent), and adults with speech disabilities (53-55 percent). These figures nearly quadruple for adults with mental retardation (86-87 percent).

Students with low-incidence disabilities may represent the most extreme example in our school system of what Stanovich (1986) termed Matthew effects in reading. Stanovich argued that reading comprehension growth is facilitated by general knowledge, vocabulary, and syntactic knowledge, and that these competencies are facilitated by reading itself. That is, children with greater knowledge of words and the world learn to read more quickly, consequently read more, experience reciprocal growth in cognitive and linguistic skills, and the gap between the better readers and poorer readers widens rapidly throughout school. Stanovich applied this argument narrowly to specific reading disability in the absence of other disabilities. We believe these same principles apply more generally in children with low-incidence disabilities.

Instructional possibilities have increased dramatically in recent years for students with low-incidence disabilities. Assistive and instructional technologies are eliminating or reducing the behaviorally intensive demands of most learning materials and experiences. Students with severe physical, communication, or cognitive disabilities can compose at keyboards controlled by eye movements and use word-processing programs that support spelling and grammar. They can use alternate input methods that enable text output via picture input; read and experience multimedia stories in which text is highlighted and read aloud or branching programs provide visual and auditory supports to concept development. They can communicate via synthetic and digitized voice-output devices. They can manipulate books independently with electronic page turners, CD-ROM books on computer, videotape, and audiotape.

In sum, children with low-incidence disabilities are included in this review for three reasons. First, they tend, generally, to experience severe and lasting difficulties in learning to read, which teachers and researchers need to understand better. Second, the framework for understanding these difficulties does not appear to be substantially different than that for other children who find learning to read difficult. Consequently, comparison with other populations of children with disabilities may prove informative to researchers and educators. Finally, technology development has reached a level of sophistication in which many, if not most, of the former impediments to learning to read and participating in the classroom can be reduced or eliminated.

Methodology

As was noted in Chapter 1 of Section I, we began our synthesis research by asking individuals with complementary areas of substantive expertise to comment on what they perceived were critical issues and findings in available research on this topic to date. In addition to considering information about contemporary conceptual models and other relevant comments by the four Section I experts, we solicited the input of Dr. Carol LaSasso (Gallaudet University), who provided expert information about research on reading comprehension among students who are deaf or hard of hearing. We considered each of these commentaries, as well as our own independent review and critique of the research literature, as we prepared the synthesis presented in this section of the report.

Computer searches were conducted using the ERIC (1966-present) and Psychlit Abstracts (1982-present) databases. Search terms yielding the greatest number of studies included cross-references of: *reading comprehension* or *instruction* with *autism, cerebral palsy, deaf, developmental disabilities, Down syndrome, hard of hearing, mental retardation, multiple disabilities, and severe disabilities.* Other terms were searched (including *physical disabilities, literacy, severe handicaps, physical handicaps, cognitive impairments, exceptional children*, and *physical involvement*) but yielded few additional studies. Further papers were gleaned by checking the reference sections of all obtained documents for additional studies. Finally, colleagues were contacted regarding work in progress or currently unpublished sources.

Research papers in the resulting collection were initially separated into one of two umbrella categories: (a) studies of reading abilities and processes that were reviewed for their potential to inform our understanding of reading comprehension instruction, and (b) reading comprehension instruction studies. As the studies were reviewed, subcategories were identified within each of these two larger divisions, and studies were grouped and regrouped for comparison and contrast according to research questions or topical focus (e.g., studies involving oral reading issues, visual perceptual abilities, small and large group instruction). It should be noted that few of the subcategories contained more than one or two studies; research in literacy instruction and children with low-incidence disabilities received little attention prior to the last 10 years (see, e.g., Koppenhaver, Pierce, Steelman, & Yoder, 1995). Subcategories containing the largest number of studies are represented in this review under separate headings, and we have attempted to synthesize findings with the intent of informing instruction and future research, since there is an inadequate number of studies and no replication from which to conclude what is known about reading comprehension instruction for children with low-incidence disabilities.

Overview of This Section

The remainder of Section II contains four chapters. Chapter 2 examines research on correlated skills of reading comprehension proficiency, while Chapter 3 considers research on proven instructional strategies and practices. Chapter 4 reviews research on reading comprehension for children who are deaf or hard of hearing. Chapter 5 provides several concluding comments about

the extent of current knowledge, as well as limitations in what is currently known about interventions that support improved reading comprehension among children with low-incidence disabilities.

CHAPTER 2

CORRELATES OF READING COMPREHENSION IN CHILDREN WITH DEVELOPMENTAL DISABILITIES

In this chapter, we briefly address three areas of study examining correlates of reading comprehension performance in children with developmental disabilities: visual perceptual and auditory skills, speech and phonological skills, and memory and cognition. In most of these studies, reading comprehension is measured with a standardized reading assessment instrument adapted in order to accommodate subjects disabilities (e.g., pointing responses instead of writing or speaking, or untimed instead of timed administration).

Visual-Perceptual and Auditory Skills

Researchers seeking within-child explanations for the prevalent reading difficulties of individuals with cerebral palsy (CP) have tended to study the relationship of visual-perceptual or auditory skills to reading comprehension. The studies sort themselves into two types C studies demonstrating correlations of these skills with reading comprehension difficulties and studies suggesting that difficulties in these areas do not necessarily impair reading comprehension. Dorman s (1985, 1987) work is representative of the former type. In a pair of studies of adolescents with cerebral palsy, she reported that measures of visual perception, auditory perception, and nonverbal auditory perception, as measured by subtests of the Luria-Nebraska Neuropsychological Battery (Golden, Hammeke, & Purisch, 1978), were positively correlated with subjects performance on the reading comprehension subtest of the Peabody Individual Achievement Test (Dunn & Markwardt, 1970). She noted that while most of the subjects were more impaired in visuospatial perceptions than in other cognitive abilities, their reading skills were more highly related to their verbal and auditory skills.

Smith (1989, 1992) administered a battery of visual, auditory, and memory tasks with 7- to10-year-old children of average intelligence with cerebral palsy in a special school in Ireland. She reported that the visual discrimination subtest of the Carrow Auditory Visual Abilities Test (Carrow-Woolfolk, 1981) correlated more highly (r = .61) than other measures (r = .29) with performance on the SPAR Group Reading Test (Young, 1987), a measure of word meaning and sentence comprehension. Students reading performance and visual perceptual scores fell significantly below population means.

Representative of the latter type of study is Rowan and Monoghan s (1989) correlational study of 10 children, ages 8 to15 years, with cerebral palsy. Subjects were individually administered the Neale Analysis of Reading Ability and the Bender Visual Motor Gestalt Test. While 70 percent of the subjects had significant deficits in visual and perceptual skills, all of the students had mastered basic reading. Likewise, in a study of eye-movement patterns in text reading, Jones et al. (1966) report that reading speed, but not text comprehension, was impaired in 28 adults with cerebral palsy, capable of reading at or above the third-grade level on the Gates Test of Reading Ability. In fact, five of six best readers, who could read at or above the seventh-grade level, had the most severe eye-movement disorders in the sample.

Taken as a whole, then, these studies have yet to demonstrate the central importance of visual-perceptual or auditory skills in either explaining or remediating the widespread and severe reading comprehension deficits of persons with CP. Studies attempting to investigate the impact of interventions in these skill areas on reading comprehension are as yet undocumented in the literature. Researchers and teachers need to be aware of the prevalence of visual and auditory perceptual disabilities, but there is insufficient evidence to suggest that they either explain reading comprehension difficulties or even consistently contribute to the observed difficulties across individual students.

Speech and Phonological Skills

The relationship between impaired speech production and phonemic awareness is an area that has received sustained research attention in persons with cerebral palsy (CP) (e.g., Bishop, 1985; Bishop & Robson, 1989a, 1989b; Foley, 1989). In general, this research finds that nonspeaking adolescents and adults with CP, who are able to comprehend text at or above the second-grade level, perceive rhyme and homophony in both words and nonwords. Subjects with impaired speech make more, but not different, errors than control subjects with speech, but experience substantially greater difficulties in learning to read with comprehension.

Studies of children with mental retardation further complicate the relationship between phonological awareness and reading success. Cossu, Rossini, and Marshall (1993) administered a battery of phonological tasks to 10 children, ages 8 to 15 years, with Down syndrome (mean IQ 44) and 10 non-disabled peers, ages 6 to7 years, who were matched on reading ability. Subjects with Down syndrome performed significantly more poorly on all phonological tasks yet were able to perform reading comprehension tasks at levels of understanding comparable to non-disabled peers. Kabrich and McCutchen (1996) found that children with mental retardation read isolated sentences containing rhyme or alliteration more slowly than non-disabled peers matched for reading ability, but again sentence comprehension and word recall were comparable.

Further studies, employing a wider and more systematic array of both phonological awareness and comprehension tasks and texts, are required to determine if there are more subtle differences in comprehension performance in children with developmental disabilities, to explain those differences more clearly, and to design instructional intervention studies. To date, however, this research does not suggest that phonological awareness is a prerequisite to learning to read, nor does it shed much

light on the widespread and significant literacy learning difficulties of most children with developmental disabilities. The only instructional implication we find is that in tasks of phonological awareness, nonspeaking students with cerebral palsy are more successful when the spoken word is paired with its print match than when print is simply presented visually (e.g., Berninger and Gans, 1986; Bishop and Robson, 1989a). Teachers should consider pairing spoken and written stimuli for nonspeaking students with cerebral palsy when introducing new vocabulary, concepts, or sight words. These students initially may depend on an external speech match in order to transform it into their own internal speech.

Memory and Cognition

Research in cognition and reading comprehension has received some attention in two primary areas of study: sentence-processing abilities of children with mental retardation and descriptive studies of children with hyperlexia. Representative of the former studies is Merrill and Jackson s (1992) study of 63 students with mental retardation, average chronological age 17 years, and their non-disabled peers. Subjects were randomly presented with sets of sentences representing a continuum of subject/verb/object relatedness. For example, the hunter shot the rabbit was categorized as having a high degree of semantic relatedness, and the photographer chased the rabbit a low degree of relatedness. No significant differences were found between the two groups in comprehension of sentences with a high degree of relatedness. When the degree of semantic relatedness decreased, however, the students with mental retardation evidenced slower response times, suggesting that encoding and comprehension processes, and not memory retrieval, may be a source of reading difficulty.

Kabrich and McCutchen (1996) suggest that students with mental retardation may send inaccurate phonemic codes to working memory and also be inefficient in maintaining these codes to assist comprehension. They asked 16 young adolescents with mental retardation (mean IQ 66) and 16 non-disabled children, matched for word-reading accuracy and mental age, to read phonemically similar sentences (i.e., sentences rich in alliteration or rhyme). Similarly to the Merrill and Jackson (1992) study, comprehension was comparable in the two groups, but students with mental retardation evidenced slower response times when reading the phonemically similar sentences. The authors hypothesize that slower reading rates increase the demands on working memory and would greatly impair reading comprehension at the passage level. Cossu, Rossini, and Marshall s (1993) study of 8- to 15-year-old children with Down syndrome fails to confirm this hypothesis, however.

Descriptive studies are numerous of students with hyperlexia, who typically display word-recognition abilities greatly in excess of language or reading comprehension abilities (e.g., Elliott & Needleman, 1976; Huttenlocher & Huttenlocher, 1973; Mehegan, Fritz, & Dreifuss, 1972; Silberberg & Silberberg, 1967). The syndrome is most often described in, but not limited to, students with autism or mental retardation. On reading tasks, children with hyperlexia seem to be able to make use of passage context to process syntax but not meaning (Frith & Snowling, 1983, Temple, 1990). Some researchers attribute hyperlexia to general information-processing deficits (Cobrinik, 1982, Healy 1982; Healy, Aram, Horwitz, & Kessler, 1982), while others suggest it represents a failure to

use semantic context, perhaps because students are unable to integrate individual word knowledge with background knowledge in text processing (Frith & Snowling, 1983; Snowling & Frith, 1986).

These two areas of study in memory and cognition, as a whole, suggest that children with mental retardation may read more slowly than non-disabled peers when sentences have little semantic-relatedness or are rich in alliteration or rhyme. At the sentence level, and in one study of passage comprehension, this does not seem to interfere with reading comprehension. Studies of hyperlexia document its presence in some children with autism or mental retardation but have yet to determine its causes or effective remediation.

CHAPTER 3

READING COMPREHENSION INSTRUCTION FOR CHILDREN WITH DEVELOPMENTAL DISABILITIES

Instructional research has identified three areas that educators might address in attempting to improve reading comprehension in children with developmental disabilities: (a) environments and expectations in early childhood; (b) classroom learning opportunity; and (c) specific instructional intervention strategies.

Environments and Expectations in Early Childhood

Survey data consistently report that from young ages, many children with developmental disabilities interact with teachers and parents who hold low expectations for their literacy learning capabilities (Marvin & Mirenda, 1993). In one statewide survey, 25 percent of parents and teachers of nonspeaking children with cerebral palsy reported that they believed the children would make no progress in learning to read by the time they left school (Light, Koppenhaver, Lee, & Riffle in Light & McNaughton, 1993). In another study of parents of children with CP, literacy appears to be displaced as a high priority by initial, and ultimately lasting, concerns about the children s physical and communication impairments (Light & Kelford Smith, 1993). While experimental studies linking reading comprehension outcomes to parent or teacher expectations are absent in this literature, the survey data suggest that at minimum children with disabilities face a different set of expectations and potentially greater challenge than non-disabled peers in learning to read. Whether these expectations arise from or contribute to children s lesser reading abilities, language or cognitive delays, communication impairments, and other individual differences requires further study.

Classroom Learning Opportunity

Mike (1987; 1995) and Koppenhaver (1991) report the most detailed descriptions of the nature of classroom learning opportunities provided to elementary-school-aged children with developmental disabilities. Mike observed 63.5 hours of instruction across a four-month period in a single, self-contained classroom serving five children with cerebral palsy, four of them with severe speech and physical impairments. Students were provided an average of 30 minutes of literacy instruction per day, taught primarily one-to-one despite the small class size, and rarely interacted

with one another to discuss literacy-related events.

Koppenhaver (1991) analyzed more than 50 hours of videotaped literacy instruction across a school year in the self-contained classrooms of three special educators who held high expectations for the literacy learning of their students with severe speech and physical impairments. The teachers engaged in greater amounts of literacy instruction than Mike (1995) reported, 47 to 61 minutes per day and less one-to-one instruction (54 to 66 percent of instructional time). However, students received little reading comprehension instruction or opportunity to engage texts. Average daily time spent reading texts of a paragraph or longer ranged from 50 seconds to 10 minutes, and students listened to teachers read aloud texts of a paragraph or longer 3 to 9 minutes per day. The vast majority of instructional time was devoted to the completion of worksheets and study of words in isolation.

Johnston s (1994) descriptive study of the instruction provided to three nonspeaking children, ages 8 to 12, with cerebral palsy finds learning opportunity little better in inclusive classrooms. Two of the subjects, in inclusive fourth- and fifth-grade classrooms, spent less than five minutes per day reading texts of a paragraph or longer. Singh and Singh (1988) report that, prior to their word-identification intervention study, three children, ages 9 to12 with moderate mental retardation, received 10 minutes of reading instruction three times per week.

A growing body of research has attempted to describe teacher-student interaction during reading comprehension lessons for nonspeaking students with cerebral palsy. Harris (1982) conducted the first such study. Videotape analysis revealed that during small-group reading lessons, the frequency of teacher and student conversational turns was similar. As might be expected, teachers contributed more information per turn and initiated many more topics. Most disturbing, however, were findings that students rarely interacted with anyone except the teacher and that almost all of their communications were single-word responses to direct questions. Similar results are reported in more recent classroom interaction studies (Koppenhaver, 1991; Mike, 1995).

Koppenhaver, Hedrick, Abraham, and Yoder (1992) explored the question of how well teacher-directed comprehension lessons match best-practice recommendations for non-disabled students (Tierney & Cunningham, 1984) in three classrooms serving nonspeaking children with cerebral palsy, ages 10 to 14 years. Microanalysis of 56 videotaped reading-comprehension lessons revealed that in just four lessons did teachers guide students through the full sequence of research-recommended steps of background knowledge instruction, purpose-setting, reading, comprehension task follow-up, and feedback provision. In nearly half of the lessons (N=27), no purpose was set for reading, and the most frequent purpose (N = 20) was a version of, Read this and I ll ask you some questions when you re done.

McLellan and Koppenhaver (1997) reanalyzed the data from this last study with reference to Ruddell, Draheim, and Barnes s (1990) taxonomy of comprehension and levels of thinking. Analysis of the videotaped reading comprehension lessons suggested that teachers tightly controlled not just the structure of instructional conversations by initiating topics and directing questions at students, but also the level of student processing of text. Almost without exception, students responded at or below the level of the teachers questions. For example, if a teacher asked an interpretive question, students replied with an interpretive response or a lower-level literal response. Unfortunately

teachers rarely asked inferential, evaluative, or main-idea questions, and students consequently engaged texts primarily in order to identify literal information.

Ethnographic and observational reports, then, suggest that reading comprehension instruction and learning opportunity receive little emphasis in the instructional programs typically provided to students with developmental disabilities, a finding consistent with studies of children with learning disabilities and mild mental retardation (e.g., Haynes & Jenkins, 1986; Ysseldyke, Thurlow, Christenson, & Weiss, 1987). Analyses of classroom interactions suggest that teachers may be doing little to assist reading comprehension in nonspeaking children with cerebral palsy. Further research might document the specific effects of this kind of instruction on student learning. However, a more useful direction might be implementing successful interventions adapted or replicated from instructional research with non-disabled children and measuring the effects on reading achievement in children with developmental disabilities.

Intervention Strategies

Reading comprehension intervention studies involving children with developmental disabilities are few in number but suggest fruitful directions for future development work. Zetlin and Gallimore (1983) examined the effects of a questioning technique they call responsive questioning in which teachers structure questions in response to student utterances. The technique is intended to more actively engage students in the process of making sense of questions and connecting textual information to their own knowledge base. Three students, ages 12 to 14 years, with moderate mental retardation participated in 20-minute lessons three times a week in which they read preprimer texts and then were engaged in this responsive questioning. Transcript analysis of teacher-student interactions revealed increased student ability to draw inferences from text, to respond appropriately to higher-order questions, and to employ self-regulated comprehension strategies.

Kamps, Barbetta, Leonard, and Delquadri (1994) investigated the impact of a classwide peer tutoring (CWPT) model in inclusive classrooms serving three boys, ages 8 to 9 years, with autism. All students in the three classrooms were trained in CWPT methods: working in pairs, alternating tutor-learner roles, practicing verbal and written skills (e.g., reading aloud), and providing praise. Researchers found that all three subjects with autism demonstrated significantly improved reading comprehension as measured by their ability to respond correctly to questions.

Two intervention studies detail cases of children with multiple disabilities who were provided theoretically driven literacy interventions. In the first, Worthy and Invernizzi (1995) employed a learner-centered, literature-based intervention with a 14-year-old girl with severe mental retardation and hyperlexia. On a variety of standardized cognitive and language assessments administered at baseline, the subject obtained age-equivalent scores of 5 to 7 years and percentile scores of one. The subject could read aloud texts in informal reading inventories at the ninth-grade level with 90 percent or better accuracy, but her reading comprehension fell below the primer level. She correctly answered simple vocabulary and literal information questions on primer and first-grade level passages. Intervention was conducted 50 minutes per day, four days per week, across three 12-week sessions.

Tutoring sessions included a meaning focus in reading lessons, reading of easy tradebooks, story grammar lessons, written and personal response logs, reading and writing for information, and semantic word-study strategies. Small-group reading lessons were also conducted. Post-testing on informal reading inventory passages demonstrated reading comprehension improvement to passages at the third-grade level and improved understanding of story grammar elements as demonstrated in story retellings.

Erickson, Koppenhaver, Yoder, and Nance (1997) document the learning progress of an 11-year-old with cerebral palsy who required a wheelchair for mobility and communicated via a dedicated voice output device. Although assessment was extremely difficult due to the boy s multiple impairments and often idiosyncratic modes of communication, the subject was believed to have moderate visual impairments and severe cognitive impairments. Intervention included integral use of dynamic assessment strategies driven by a whole-part model of reading comprehension (Cunningham, 1993) and intended to result in a balanced instructional program designed to maintain the child s relative strengths while improving his relative weaknesses (Cunningham & Allington, 1994). Intervention integrated communication strategies (i.e., increasing vocabulary access and use of a voice output device) and therapies (e.g., development and use of a personalized splint for typing access, designing independent access to books) with literacy instruction that included language experience, journal writing, direct instruction in word identification and reading comprehension, and writing via picture symbols and letter-by-letter spelling. Across a two-year period in inclusive fourth- and fifth-grade classrooms, the student demonstrated significant progress in various areas of written and oral communication, but reading comprehension lagged at the primer and first-grade level.

Taken together, these few reading comprehension intervention studies involving children who have developmental disabilities suggests that independent reading with comprehension is a realistic, but difficult instructional goal for children with severe and multiple disabilities. Survey data suggest that parents and teachers often hold low expectations for a child s learning success beginning when the child is very young. Observational studies suggest that instructional environments lack many of the features that research with non-disabled children suggests are effective in supporting and improving text comprehension. Intervention research suggests that if a variety of these features are incorporated into the instructional programs of children with developmental disabilities, gains are possible in reading comprehension. None of this research begins to define an efficient, systematic, or long-term approach to reading comprehension instruction for children with developmental disabilities.

CHAPTER 4

READING COMPREHENSION INSTRUCTION FOR SCHOOL-AGED CHILDREN WHO ARE DEAF OR HARD OF HEARING

The reading comprehension deficits of school-aged children who are deaf or hard of hearing have been documented for years (Balow & Brill, 1975; Davis, Shepard, Stelmachowitz, & Gorga, 1981; Furth,1966; Quigley & Paul, 1984; Trybus & Karchmer, 1977; Wrightstone, Aranow, & Moskowitz, 1963). Several factors have been identified that account, at least in part, for the difficulties that deaf students encounter in comprehending text. The first is that most deaf children do not have a means to communicate until well after the diagnosis of hearing loss is made. Depending upon the severity of the hearing loss and the presence of risk factors, the median age may range from 7 to 28 months (Harrison & Roush, 1996). Until diagnosis, and for many children even afterward, an adult who is able to easily communicate with them and assist them is understanding their complex environment is seldom available. Because of this deficit, most children who are deaf or hard of hearing have limited prior knowledge and background experiences which facilitate comprehension of the topics found in print.

A second consequence of this deprivation in early language experience is that few ever achieve real fluency in English oral or written language. Despite intensive therapeutic and educational intervention from infancy to adulthood, deaf readers have smaller vocabularies, tend to ascribe one meaning to each lexical item, have difficulty with figurative language and complex syntactical structures, and typically read at a surface level (Quigley & Paul, 1984).

An additional cause for difficulties in reading comprehension may lie in the form of communication used by deaf and severely hard-of-hearing children in this country. Since the early 1970s, total communication or one of several pedagalogically constructed signed systems has been the method of communication used by most educational programs. These visual, kinesthetic codes differ from that used by hearing readers who have the advantage of employing a speech to print code. As a function of this difference, deaf readers must first recode print into sign language, which is structurally independent of English. While some deaf and many hard-of-hearing children are able to use their residual hearing in a sound-based approach to decoding print, the phonological systems they have developed are often incomplete or distorted (Levitt, Stromberg, & Gold, 1978; Smith, 1975). Thus the task, while similar, places different demands upon a reader with hearing loss.

Instructional Approaches

Although numerous studies have documented the prevalence and degree of reading comprehension difficulties among students with educationally significant hearing loss, a relatively small proportion of the literature has addressed instruction in reading comprehension. Most of the literature in reading comprehension instruction can be categorized into one of four groups: (a) syntax/grammar learning, (b) vocabulary building, (c) the use of sign language to enhance reading comprehension, and (d) the development of metacognitive strategies. Each of these approaches is discussed in greater detail below.

Syntax and Grammar Learning

The bulk of literature regarding student's difficulties in reading comprehension has focused on deficits in their syntactic and morphological skills. The majority of this research was conducted in the 1970s and early 1980s, when transformational grammar was viewed by many educators and early interventionists as a way out of the language/reading conundrum. Professionals reasoned that if students were taught language in a hierarchical, transformationally systematic manner, language skills and thus reading comprehension would improve. Much of the literature from that period reflects attempts to implement and/or evaluate this premise (Cooper, 1967; McKee & Lang, 1982; Power & Quigley, 1973; Quigley, Smith, & Wilbur, 1974; Quigley, Wilbur, & Montanelli,1974; Robbins & Hatcher, 1981; Schmitt, 1968; Scholes, Cohen, & Brumfield, 1978). The results of these studies and others indicate that while deficits in knowledge of syntactical and morphological structures such as pronominalization, passive voice, relative clauses, negation and question formation detrimentally affect reading comprehension of students who are deaf or hard of hearing, instruction in transformational grammar has yielded minimal increases in reading comprehension scores.

Vocabulary Building

Another factor that has not been as widely studied is the relationship between lexical knowledge and reading comprehension among children who are deaf or hard of hearing. Despite the paucity of empirical evidence to support a relationship (LaSasso & Davey, 1987) and none to substantiate a causal one, teachers of hearing-impaired students have identified vocabulary deficits as a primary determiner of text difficulty (LaSasso, 19). Vocabulary development as a strategy to enhance reading comprehension is employed in many programs, and agreement among practitioners that vocabulary deficits are important components in the impoverished reading comprehension of deaf and hard-of-hearing students can be found throughout the literature (King & Quigley, 1985; Moores, 1982; Quigley & Paul, 1984).

Sign Language

A relatively new area of the literature has focused on the deaf student as a bilingual learner who uses English (spoken and signed) and American Sign Language (ASL). While most deaf children in the United States have English-speaking parents and English is the language to which they are exposed during their early years, some educators and researchers believe ASL to be the first language that is fully accessible to them. Thus, ASL is considered to be the first language and English the second of many deaf children. In this paradigm, individuals who attain fluency in ASL are considered to be reading in the non-native language, and English literacy skills can subsequently be taught from a second-language approach. This perspective has been fully delineated by Bouvet (1990), Strong (1988), and Supalla (1991).

Andrews, Winograd and Deville (1994) studied the effects of using ASL summaries to build deaf children's background knowledge before reading fables in English. Results indicated that the ASL summary technique increased the quantity and quality of the children's fable-retelling scores and also improved the deaf readers comprehension of the moral lessons of the fables.

Although there are few studies to support the use of ASL to increase reading comprehension, there are teacher reports of successful use of this strategy. In a national survey of teachers of preschool children regarding successful literacy practices employed in preschool classrooms, ASL storytelling and book reading was reported as a successful literacy activity (Koppenhaver & Harrison, manuscript submitted).

Metacognitive Strategies

The use of ASL to develop background knowledge overlaps with the most recent instructional focus for developing reading comprehension among deaf and hard-of-hearing readers. Just as the 1970s were the decade of transformational grammar, instruction in metacognitive strategies characterizes reading comprehension instruction in the 1980s. Metacognition refers to the knowledge about and control over learning or thinking that is possessed by the individual (Brown, 1980). Metacognitive knowledge about reading has been shown to develop with age and to be a primary link in the transition from being a novice reader to being a skilled reader. The research also indicates that like novice readers, poor readers tend to lack or have incomplete metacognitive knowledge about reading (Armbruster, Echols, & Brown 1982; Johns, 1972, 1974, 1986; Meyers & Paris 1978). Parallels have been drawn between deaf readers and poor or novice readers. Davey (1987) reported that deaf adolescents were not as sophisticated as their hearing counterparts in the development of metacognitive knowledge about reading or at least in their ability to access that knowledge.

Yoshinaga-Itano and Downey (1986) hypothesized that because deaf and hard-of-hearing children have limited experiences with stories, they lack knowledge about story structure, which accounts, at least in part, for the absence of critical elements that are essential in the definition of a story but fail to appear in those written or told by children with significant hearing loss (Yoshinaga-Itano & Snyder, 1985). Guidelines for parents and teachers to help children elaborate their schemata were provided by Yoshinaga-Itano and Snyder and included: continuing to teach scripts to children;

expanding teaching to include scripts embedded within scripts; incorporating the teaching of scriptal knowledge by exploring narratives about targeted script; helping children make a transition from an experience with the script to recognizing the script in a written narrative; teaching story grammar propositions in order to provide an organizational structure for knowledge already in children. Intense, hierarchical instruction within a metacognitive framework is essential so that the child's knowledge will no longer exist as separate and distinct elements with no overlapping of related information, but as interrelated schemata.

The instruction in the enhancement of metacognitive knowledge has occurred or been promoted at many levels. Fox (1994) studied the effects of instruction using metacognitive strategies on reading comprehension with deaf and hard-of-hearing college students. Strategies included re-reading exercises, use of overview questions regarding the content, study guides, and summarization of the readings. Perceived benefits were improved class grade averages, a lower dropout rate, increased class discussions, better analysis of the text, and students feeling of more competence.

Schirmir (1997) proposed a model of instruction for school-aged children that merged teacher-read materials and independent student reading activities. Metacognitive activities employed to develop reading comprehension skills were building or enhancing background knowledge, teaching new vocabulary, providing a purpose for reading the text material, reading silently, and using semantic maps, graphic organizers, or outlines to reflect and/or guide class discussions. These strategies were found to be helpful in providing children with support in comprehending material that had been considered beyond their reading levels.

Schirmir (1995) investigated whether mental imagery could be used as a metacognitive reading-comprehension strategy by elementary children who are deaf. Results indicated that when the children were encourage to engage in mental imagery, they used recollection, representation, inference, and evaluation during and after the reading. This suggests that mental imagery can be used by elementary-level deaf children for constructing meaning from narrative text.

In a related study, Fusaro and Slike (1979) studied the effect of imagery on the ability of hearing-impaired children to identify words. The results indicated that children identified a significantly greater number of high-imagery words than medium- or low-imagery words. The authors suggested that children with hearing loss first be taught high-imagery words, and as they experience success, increase the difficulty of reading tasks by the addition of less image-salient vocabulary.

Concluding Comments

Although most of the studies reported focus on reader-specific variables to explain reading comprehension scores among deaf students, instructional variables should also be considered. In 1987, LaSasso conducted a national survey to determine what specific instructional strategies were being used to teach reading to students with hearing loss. Respondents were the person identified as responsible for or most knowledgeable about reading instruction in residential and day schools. The

results of this study, which included 478 programs serving 26,000 children, indicated that teachers used basal readers more frequently than the language-experience approach as the primary means of instruction. Although usage varied from grade level to grade level, this was especially the case at the primary, intermediate, and junior high school levels. Dismayingly, more than 10 percent of the responding programs reported that basal readers were used at the senior high school as well. The basal reader most commonly selected, *Reading Milestones*, was favored because of the appropriateness of the syntax and vocabulary, the minimal amount of figurative language, and emphasis on phonics.

The language-experience approach to reading was also used extensively; however, more than two-thirds of the programs reported that individual teachers made decisions regarding the vocabulary and reading skills to be taught within the language-experience approach and that coordination of the reading program at or between grade levels was informally structured, if it at all.

Standardized reading tests were used by more than four-fifths of the programs. Among programs that administered standardized tests, 75 percent used them for the instructional purposes of measuring growth in reading abilities and selecting appropriate instructional materials. Despite their use as the basis for instructional decision-making, two-fifths of the programs reported that standardized measures were considered to be the least valid measure of reading level. Regardless of misgivings about standardized measures, more than half of the respondents indicated that they were unfamiliar with readability formulas used to assess levels of text difficulty. This deficit should raise questions about the basic preparation of those responsible for reading instruction and the quality of the instruction provided.

The picture that emerges from a review of instructional strategies in reading comprehension is that despite meticulously documented deficits in reading comprehension skills among children who are deaf or hard of hearing, instructional strategies are sparse or at least seldom documented.

CHAPTER 5

CONCLUSIONS AND LIMITATIONS OF READING COMPREHENSION FOR CHILDREN WITH LOW-INCIDENCE DISABILITIES

At present, children with low-incidence disabilities complete high school with the lowest reading comprehension skill levels of any subgroup of the American population (see Kirsch, Jungeblut, Jenkins, & Kolstad, 1993). Yet the reasons for these reading comprehension difficulties are seldom studied and poorly understood. Assumptions that the principal source of the difficulty resides in the child s disability are seen in the emphasis on studies of reading processes and the rarity of reading comprehension instructional studies. They are seen also in the kinds of reading processes studied in particular populations of children (e.g., cognition and memory in children with mental retardation, phonological awareness in nonspeaking children with cerebral palsy).

When we review the studies of correlates to reading comprehension performance in children with low-incidence disabilities, we find little to inform classroom practice. Much like the research in learning disabilities, researchers are able to identify many areas where children with low-incidence disabilities do not perform as well as non-disabled peers and some studies where children with low-incidence disabilities present not just a depressed but a different performance profile. None of the studies are comprehensive nor replicated sufficiently to suggest that a particular processing deficit, difference, or profile is the critical source of reading comprehension difficulties in children with low-incidence disabilities.

Reading comprehension instruction studies shed little more light on what might constitute best practice. Survey and classroom observation studies suggest the need for teachers to examine their own expectations for student learning, how accessible their materials and instruction are to particular students given individual differences, and the kinds of learning opportunities that are provided in their classrooms for children with developmental disabilities. Intervention studies suggest that, given substantial resource allocation including multidisciplinary research teams and time, children with severe or multiple disabilities can be taught to read with greater comprehension. None of these studies involves more than three subjects, nor have they been replicated. Consequently, determining whether the interventions are generalizable is impossible.

There are substantial limitations in both the process and instructional studies, but we will address just two here. The greatest hindrance in understanding reading comprehension difficulties in children with low-incidence disabilities, and ultimately addressing these difficulties with more effective instructional interventions, is the absence of valid, reliable, and theoretically anchored assessment instruments or strategies. For example, research on children with developmental

disabilities has relied on behaviorally intensive standardized instruments requiring spoken, written, and often timed responses that penalize children for their communication, physical, and behavioral differences. While tests have at times been adapted to enable individuals with disabilities to respond through alternative behaviors (e.g., pointing instead of talking), there has been no examination of the differences those adaptations create in interpreting responses nor any attempt to create a theoretically anchored instrument that might lead to a clearer understanding of the reading comprehension process, potential differences or similarities to the much more widely understood reading difficulties of non-disabled children, or outcomes of intervention studies. Consequently, while we can conclude with confidence that children with developmental disabilities find it difficult to demonstrate their reading comprehension capabilities given the current range of tasks and tests, we are unable to infer the magnitude or source of these difficulties, or the most efficient instructional interventions to address these difficulties.

A second critical limitation is a near absence of studies of the impact of assistive or instructional technologies on reading comprehension in children with low-incidence disabilities. For example, we were able to identify only one published study detailing the integrated use of technologies in the reading intervention of a child with developmental disabilities (Erickson, Koppenhaver, Yoder, & Nance, 1997), and it does not address the impact of the technology, only the integrated intervention.

Technologies are available and in use in classrooms across the United States serving children with low-incidence disabilities that provide physical access to print materials (e.g., electronic page turners, books on CD-ROM), communication access in reading comprehension lessons (e.g., augmentative communication symbols, voice output and input, alternative keyboards), visual or attentional access while reading (e.g., text highlighting, talking books), cognitive or learning access while reading (e.g., interactive and animated illustrations in books on CD-ROM), and other forms of access. Yet, we have no formal process or outcome data to clarify the impact of these technologies on reading comprehension or instruction. We cannot speak with any certainty about whether these technologies assist reading comprehension or simply children s ability to demonstrate that comprehension.

This absence of data is disturbing for two reasons. First, we live in an increasingly litigious climate in public schooling, and the absence of research may ultimately restrict access to and use of technologies in reading lessons for children with developmental disabilities. Second, we live in a time of increased emphasis on wide access and integrated technology use in public school. With little outcome data to guide decision-making, we have little more than opinion to guide our expenditure of increasingly limited public funds for educating all children, including children with disabilities and their non-disabled peers.

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